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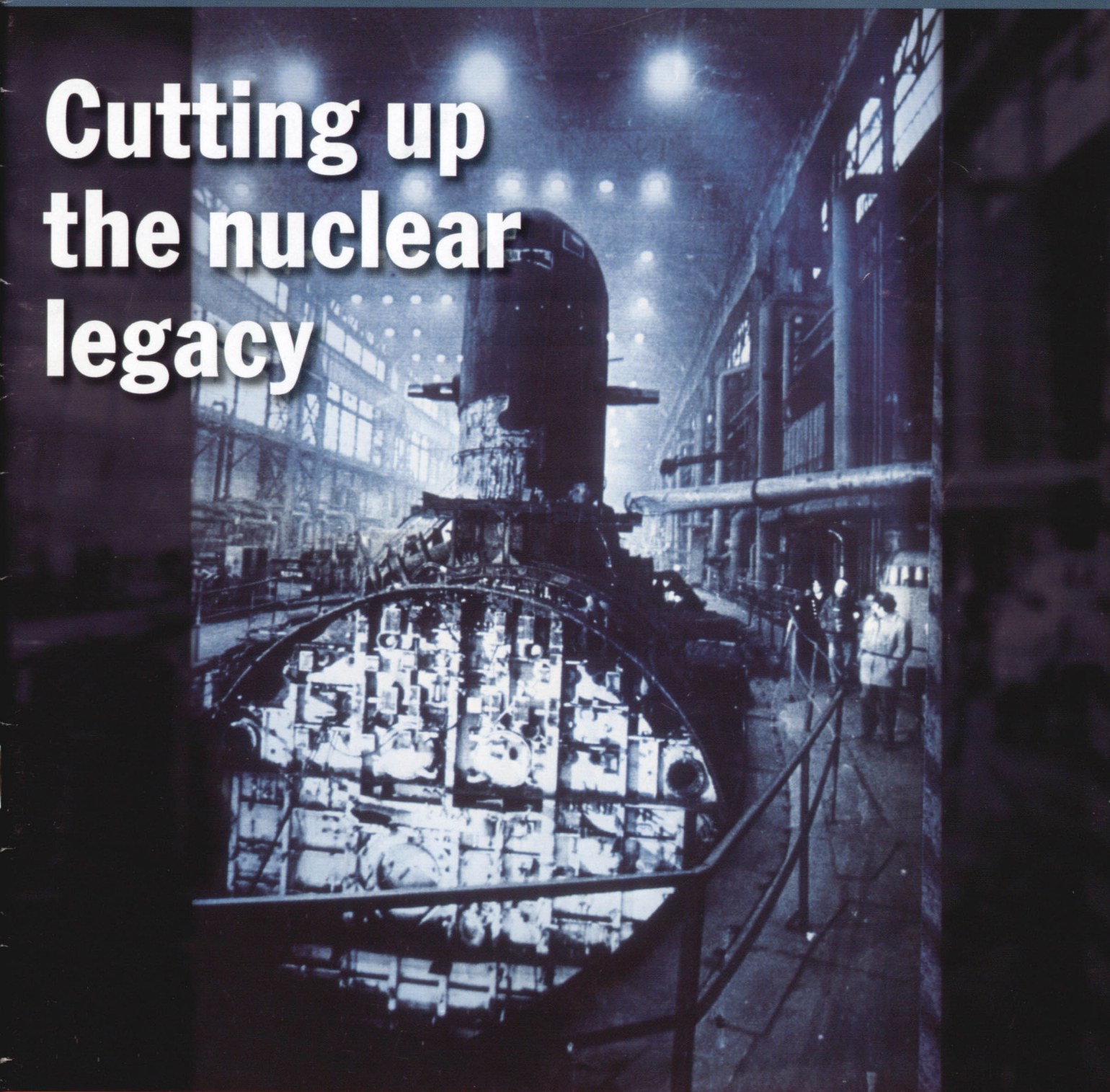

Cutting up the nuclear legacy

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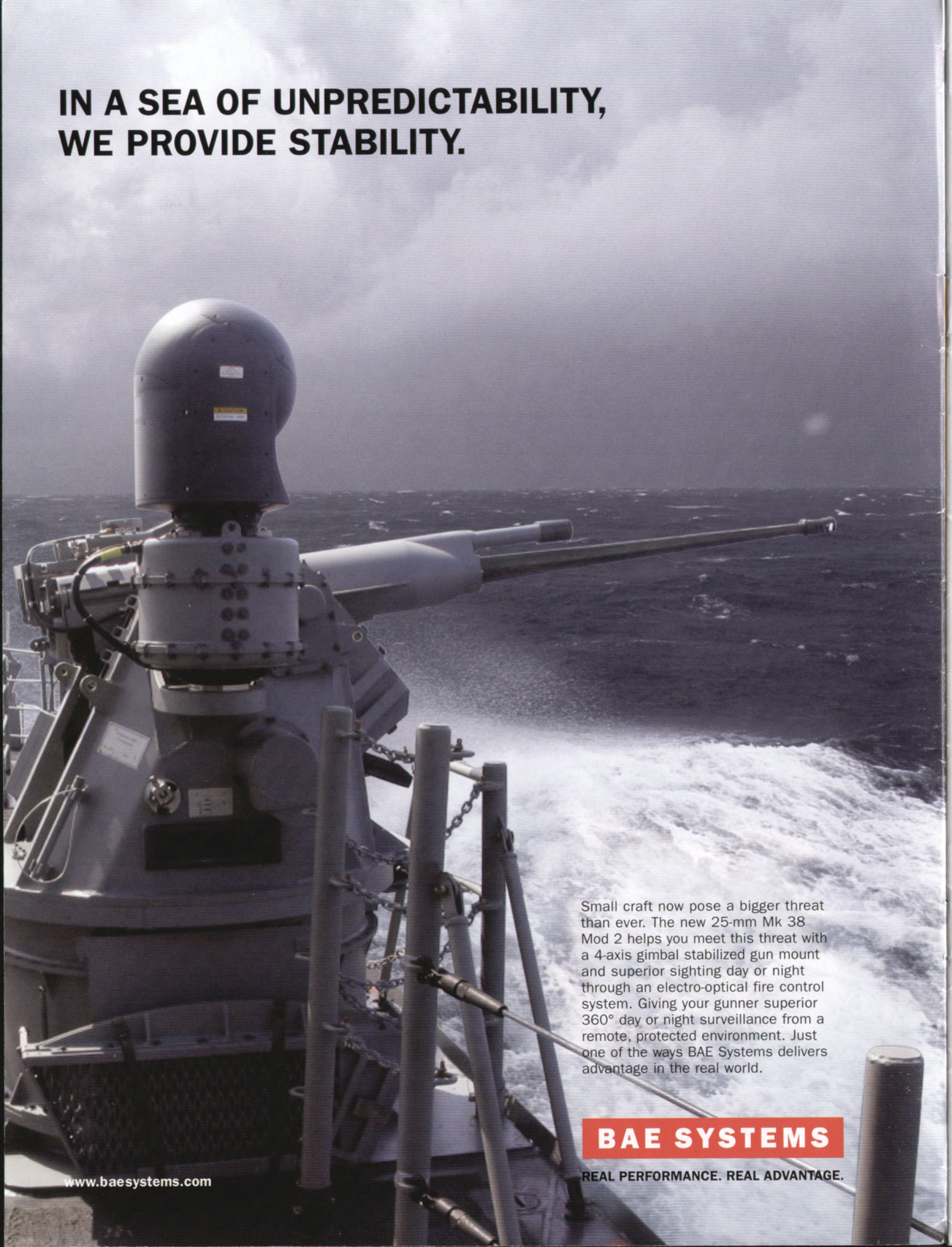
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Stories include:

- UK hands first Type 23 to Chile
- India begins work on Project 71 aircraft carrier
- Iraq IED attack marks shift in tactics
- Netherlands seeks to make light of heavy weather
- IAI's MF-STAR radar receives first order
- Apache comes aboard HMS Ark Royal
- Sweden, Italy fund new phase of M-AESA research

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Front cover:

A partly dismantled Delta-class Russian nuclear submarine in the Severodvinsk shipyard. This month's cover feature looks at the challenges of disposing of nuclear fuel and reactor cores, and current strategies in operation.

Bellona Foundation: 1155971

BPA WORLDWIDE BUSINESS

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NEWS IN BRIEF

● Ukraine restores submarine
Ukraine's sole submarine, the Project 641 Foxtrot-class diesel electric boat *Zaporizya*, is to return to sea in May 2007, according to a government announcement. Initial sea trials are set for mid-2007. The submarine completed a three-year partial refit in 2000 and was expected to return to duty in 2004, but funding delayed the programme. The boat's future is uncertain as Defence Minister Anatoliy Hrytsenko recently announced that it will be put up for sale.

● Malaysia prepares Kedahs
The Royal Malaysian Navy (RMN) plans to deploy its first two Kedah-class patrol vessels to Sepanggar Naval Base before the end of 2006. In July 2005, the Malaysian Public Accounts Committee stated that the remaining four ships in the class would require additional funding to be completed, but the builder recently stated that they will be ready in 36 months.

● ScanEagle endurance record
US-based Insitu has flown its ScanEagle D unmanned aerial vehicle (UAV) for a new record time of 22 hours. The trial constitutes a substantial improvement on the original ScanEagle C variant of the long-endurance small UAV developed by Insitu and Boeing, which has a listed endurance of 15 hours as built for service with the US Navy and Marine Corps.

● Indian Navy in nuclear control
Vice Admiral Vijay Shankar has been appointed to head up India's Strategic Forces Command, the first naval officer to manage the country's nuclear deterrent, a task hitherto undertaken by air force officers. India's long-term strategic deterrence will centre on a nuclear triad of mobile land-based missiles, air and naval nuclear forces, although the maritime component is still under construction.

● US improves SDV fleet
The US Navy and US Special Operations Command have increased and improved on their inventory of Mk 8 Mod 1 SEAL Delivery Vehicles (SDVs) through the acquisition of four Mk 8 Mod 1 SDVs and the parallel upgrade of 10 existing SDVs to the enhanced standard. The modernisation addresses about 40 per cent of the vehicle's systems.

Budget doubts cast shadow over Shaman

BY RICHARD SCOTT

KEY POINTS:
- *Shaman is intended to provide selected RN warships with an advanced communications ESM capability.*
- *A team led by BAE Systems Insyte was downselected as preferred contractor for the GBP140 million programme in February 2005.*

Richard Scott/NAVYPIC: 1155981

The Shaman CESM system is intended to replace the capability currently provided by the COBLU suite fitted to Type 22 Batch 3 frigates

Budget pressures have cast doubt over the future of a key UK maritime intelligence, surveillance, target acquisition and reconnaissance (ISTAR) programme intended to give selected Royal Navy (RN) warships a state-of-the-art communications eavesdropping system.

Project Shaman is intended to offer the RN a new surface ship communications electronic support measures (CESM) capability to succeed the COBLU (Cooperative Outboard Logistics Update) CESM suite currently in service aboard the RN's four Type 22 Batch 3 frigates. The programme, being managed by the Joint Electronic Surveillance Integrated Project Team (dual accountable to the Defence Procurement Agency [DPA] and the Defence Logistics Organisation), is intended to encompass the supply and integration of CESM systems aboard both Type 23 frigates and Type 45 destroyers, together with the provision of training and through-life support over a period of more than 20 years.

A US/UK contractor team led by BAE Systems Integrated System Technologies (Insyte), bidding a solution known as Sextant with the Information & Electronic Warfare Systems business of BAE Systems North America, was downselected as preferred contractor for the GBP140 million (USD266.6 million) programme in February 2005. It subsequently completed a seven-month Advanced Demonstration Phase intended to facilitate further risk-reduction activities ahead of a Main Gate decision originally planned for the first half of 2006. As part of a wider maritime ISTAR capability, Shaman is intended to provide advanced interception, recognition, direction finding and monitoring facilities across the major communications bands. The system had been scheduled to enter service at the turn of the decade to succeed COBLU, which is now facing obsolescence.

However, *Jane's* has learned that the award of a manufacture contract to BAE Systems Insyte is on hold while Ministry of Defence (MoD) spending priorities in the current financial year are reviewed and prioritised. A decision on whether to defer the Shaman programme by two years, or possibly cancel the project, is now expected by the end of December 2006. It is understood that DML, which lost out to BAE Systems Instye for the Shaman programme but continues to provide contractor support to COBLU, is continuing to work with the MoD to sustain the COBLU capability for an extended period.

The value of CESM outputs has received increasing recognition in recent years as a consequence of the shift towards operations in the near-land environment of the littoral. Consequently, with a far greater emphasis on maritime and joint expeditionary operations, the interception and exploitation of signals of interest emanating from land-based communication nets is seen as increasingly valuable in developing the tactical picture and informing advice to the command.

In a statement, the DPA said: "Shaman assessment work continues in preparation for a Main Gate, at which point the main investment decision on proceeding to the manufacture phase contract." BAE Systems Instyte declined to comment.

France test fires M-51 intercontinental ballistic missile

BY PETER LEWIS

France fired its new nuclear M-51 intercontinental ballistic missile from a test centre in the Landes region of southwestern France on 9 November, in a first launch described by the French Defence Ministry as "completely successful".

With an estimated range of 9,000 km, the M-51 will begin replacing the current 6,000 km-range M-45 missile aboard France's fleet of four Triomphant-class missile-launching submarines in 2010.

The test missile, fired over the Atlantic, carried no warhead. Once in service, the M-51 will carry six independently targetable warheads. The land-based test of the M-51 will be followed by an underwater firing from a test pool in 2008.

The French division of EADS Space Transportation is prime contractor in the M-51 programme, which has already cost France EUR5.7 billion (USD7.2 billion). A further EUR2.8 billion will be spent on completing trials and building and delivering 16 of the weapons aboard all four ballistic missile boats between 2010 and 2015.

The first batch of M-51s will be fitted aboard the new SNLE *Le Terrible*, which is being built by DCN in Cherbourg, while the other M-51s will gradually replace the M-45 on existing boats.

Initially, the M-51 will carry the same TN-75 warhead that equips the M-45. However, a more powerful warhead dubbed Tete Nucleare Oceanique will be fitted to the weapon around 2015-17.

USCG details cutter bid requirements

BY STEPHEN TRIMBLE AND NICK BROWN

Integrated Coast Guard Systems (ICGS) has formally requested bids to fulfil the US Coast Guard's (USCG) Fast Response Cutter-B (FRC-B) requirement for 12 new patrol vessels to fill a looming capability gap.

ICGS intends to select the winning FRC-B bid from among 27 different designs expected to be submitted by 19 international companies. The USCG will then purchase construction rights for the design, and ICGS will select a contractor to build the patrol boat at a US shipyard.

Interested contract builders for the FRC-B must submit a technical proposal by 8 January and a cost proposal by 29 January. The USCG is planning to begin operating the first FRC-B around 2010, depending on the availability of funding, ICGS spokeswoman Margaret Mitchell-Jones said.

Delivery of the full FRC-B fleet will be followed by the selection of a more sophisticated vessel, in the shape of about 46 FRC-A ships, which will feature a composite metal hull and more advanced capabilities, she added.

The dual-ship strategy for the FRC fleet is a dramatic departure from the USCG's original vision under the Deepwater programme.

Prior to the 11 September 2001 terrorist attacks, the USCG planned to replace the legacy Island-class 110 ft patrol boat fleet with a 147 ft FRC by 2018, but a sweeping review of the Deepwater acquisition strategy accelerated the FRC programme by almost a decade.

USCG: 1043696

USCGC *Matagorda*, the first vessel to undergo the stalled 123 ft cutter modification programme.

The USCG then planned to improve its capabilities in the short term by modifying its 110 ft patrol boats with a stern launch fitting and a 13 ft plug, providing extra room for over-the-horizon communication links and updated command-and-control systems. But the condition of the individual boats was worse than expected and the project stalled after the eighth boat was modified.

Instead, Congress directed the USCG to develop another near-term solution, and that created the two-track strategy for the FRC-A and FRC-B.

The ICGS call for bids released on 14 November 2006 prescribes an ambitious list of capabilities from the FRC-B design, which must be based on a service-proven design that has previously been, or can be, built in the US.

Requirements set out that the vessel must be crewed by 20 personnel, measure between 120 ft and 160 ft long, with a draft of 7–10 ft. It will mostly operate within 300 n miles of its base, but must be capable of five to seven days' endurance without support and able to achieve a flank speed of at least 28 kt, with an objective of 40 kt.

The USCG wants each hull to be able to provide annual availability of between 2,500 and 3,000 operating hours over a minimum of 25 years in service (with an objective of 30 years).

See jni.janes.com for more

Canada's submarine programme out of the water

BY SHARON HOBSON

HMCS *Chicoutimi*, the Victoria-class submarine damaged by fire in October 2004, has been taken out of the water at the Canadian navy's east coast maintenance facility, Cape Scott.

The submarine will remain on the synchro-lift until 2010, when the navy intends to integrate the repairs made necessary by the fire with a scheduled Extended Docking Work Period (EDWP).

While in dry dock, the navy will undertake necessary preservative and preventative measures to prevent deterioration of the submarine and its systems, and at the same time use *Chicoutimi* as a back-up source of spares for its other three Victoria-class boats. Although there had been some discussion over not repairing the submarine, that option has been rejected.

Rear-Admiral Dan McNeil, just prior to his retirement in August as Commander Maritime Forces Atlantic, told *Jane's*: "There are some naysayers who think that you can get away with only three boats. And if you can, like you can with the 280s [Iroquois-class destroyers], why don't you? Well you can't... We cannot maintain one operational submarine in the Pacific and the Atlantic, without four [boats]. It cannot be done. So we would be giving up a submarine capability in the Pacific or the Atlantic if we went down to three boats... Some people don't understand that.

"It's not four boats or three boats, it's are you in the Atlantic and Pacific, or are you not?"

HMCS *Victoria* is currently undergoing its EDWP in Esquimalt, and HMCS *Windsor* will begin its EDWP in Halifax in January 2007. HMCS *Cornerbrook* will begin its EDWP in 2009.

NEWS IN BRIEF

● Russia lays third Lada keel
The keel for the third Project 677 Lada-class diesel electric submarine, *Sevastopol*, was laid down at St Petersburg's Admiralty Shipyards on 10 November 2006. The Russian Federation Navy's first deputy Commander-in-Chief Admiral Mikhail Zakharenko said the submarine is expected to join the Russian Navy in 2011.

● New Zealand launches OPV
Tenix Defence launched the first of two new Offshore Patrol Vessels for the Royal New Zealand Navy's Project Protector programme on 18 November 2006. The 1,600-ton vessel, to be named *Otago*, entered the water at the Williamstown facility in Australia. It is due to be commissioned in May 2007.

● Argentina eyes modernisation
Argentina is poised to start a far-reaching modernisation of its military equipment, including French amphibious ships and missiles. Argentina's defence minister Nilda Garre visited Paris in late October to try to find a solution for the delayed transfer of two Orage-class amphibious assault ships. She noted an interest in MICA anti-air missiles, surface-launched Exocet MM40 Block II and underwater-launched Exocet AM-39 anti-ship missiles from MBDA.

● Teseo passes trial phase
MBDA has successfully completed land-based firing trials of the Teseo Mk2/A evolved anti-ship missile at the Salto di Quirra Joint Italian Armed Forces test range in Sardinia. The missile followed a cruise profile 20 m above sea level before a destruction command was issued through the onboard datalink course-correction system once it 'intercepted' the target. The first at-sea firings are set for 2007.

● Russian frigate progress
Russia's Project 20380 Steregushchiy-class frigate programme took two steps forward in November, with the keel laying of the fourth ship, *Stoykiy*, and the departure of the first-in-class on its opening phase of manufacturer's sea trials. The 1,900-ton *Steregushchiy* is carrying out basic propulsion and navigation trials out of St Petersburg, ahead of handover to the navy and eventual commissioning planned for 2008.

UAE's Baynunahs prepare to take RAM on board

BY RICHARD SCOTT

Abu Dhabi Ship Building (ADSB) and Raytheon Missile Systems are close to signing a contract that will bring the Mk 31 Mod 1 Rolling Airframe Missile (RAM) inner-layer missile system aboard the United Arab Emirates (UAE) Naval Forces' new Baynunah corvettes.

In a back-to-back deal, ADSB will concurrently sign a contract amendment with French shipbuilder Constructions Mecaniques de Normandie (CMN) for the design modification necessary to accommodate RAM on the 72 m ships.

Six Baynunah vessels have been ordered by the UAE General Headquarters, with ADSB as prime contractor for the AED3 billion (USD817 million) programme. As strategic partner, design agent and principal subcontractor for the programme, CMN is building the first-of-class corvette and is delivering a technology transfer package for the follow-on vessels to be constructed by ADSB at its shipyard in Abu Dhabi's Mussafah industrial area.

The UAE has already selected Raytheon's RIM-162 Evolved Sea-Sparrow Missile (ESSM) to equip the Baynunah ships and a contract for the supply of ESSM all-up-rounds was recently concluded under the US Foreign Military Sales process.

Each ship will be equipped with four Raytheon Mk 56 dual-cell vertical launchers (installed in pairs on either side of the hangar) with fire control for ESSM provided by a Selex Sistemi Integrati NA-25XM tracker integrated with a CEA Electronics solid-state continuous wave illuminator.

Consideration had been given to a second NA-25XM tracker on the hangar roof to provide a second channel of fire for ESSM. However, at the start of 2006 the navy looked instead to add the latest RAM Block 1 system to provide an additional layer of self-defence.

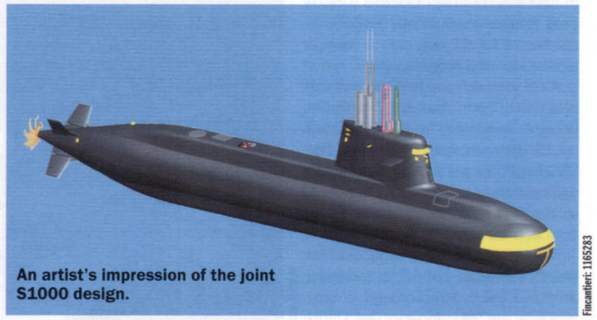
A single 21-round Mk 49 Guided Missile Launching System (GMLS) will be fitted atop the hangar roof. CMN expects to launch the first ship in mid-2008.

See jni.janes.com for more

Russo-Italian joint AIP submarine design targets export market

BY LUCA PERUZZI

KEY POINTS:
- *Fincantieri and Rubin have displayed a new AIP submarine design.*
- *It will offer advanced capabilities in a small, affordable hull.*



An artist's impression of the joint S1000 design.

Fincantieri: 1165283

Italy's Fincantieri and the Russian Rubin marine engineering design bureau jointly unveiled a new air independent propulsion (AIP) submarine design aimed at the export market at the Euronaval exhibition in Paris in late October 2006.

The companies displayed a model of the S1000 research and development project to mark the completion of a feasibility study and the beginning of the technical specification and general arrangement design phase. This is expected to conclude within the first half of 2007 and will result in a complete design, offering a cost and equipment options proposal to interested customers.

The project is promoted and funded by the Italian government, based on an Italian Navy requirement for a conventional submarine capable of accomplishing both deep and shallow coastal water operations.

This saw the Italian Ministry of Defence award a feasibility research contract to Fincantieri in December 2003, which then began working with the Rubin Central Design Bureau (under the aegis of the Rosoboronexport armament export agency) following an industrial agreement the following year.

Vice Admiral Dino Nascetti, head of Navarm — Italy's General Directorate of Naval Armament — stated that the aim of the project was to develop a platform with similar capabilities to those offered by larger conventional submarines, such as the U-212As entering Italian service, but at a substantially lower cost. He estimated that these costs could potentially be half that of the U-212A.

The submarine displayed at Euronaval has a projected submerged displacement of 1,100 t from a 5.35 m diameter pressure hull, measuring an overall length of 56.2 m with a draught of 5.4 m.

It has a single propeller shaft, with fin-mounted hydroplanes and x-form rudder. The prop is driven by a propulsion plant including a 1,000 kW multi-electronic permanent magnet motor, two turbocharged diesel engines producing 715 kW each and two diesel generators each able to pump out 650 kW. The AIP segment is based on a fuel cell set up and two battery banks of 112 lead cells, each in two separate compartments. According to specifications released at the show, the boat will have a diving depth of 250 m and a maximum submerged speed of 14 kt, although at 4 kt, it will be capable of a submerged range of 1,000 n miles running on AIP.

The weapons system will feature six 533 mm push-out torpedo tubes, capable of handling a combination of six plus eight weapons, including heavy torpedoes and anti-ship and strike missiles, mines and decoy launchers.

A possible workshare has been agreed with Russian companies providing hull materials, torpedo loading, combat system command-and-control and electro-acoustic sensors.

Italy's contribution would include propulsion plant, platform and steering control systems, and weapon systems.

See jni.janes.com for more

Visby class sees first helicopter deck landing

The Swedish Defence Materiel Administration (FMV) began a two-week test programme off Denmark in early October to certify the Swedish Navy's 650-tonne Visby-class stealth corvettes for helicopter operations, writes *Joris Janssen Lok*.

A Royal Danish Navy AgustaWestland Super Lynx Mk 90B performed the first helicopter deck landing on a first-of-class HMS *Visby* on 7 November inside Fredrikshavn Naval Base.

This was followed by a first deck landing at sea, with *Visby* sailing in the waters of the Kattegat outside Fredrikshavn.

According to Mats Elofsson, Visby programme manager in the FMV, it was decided to conduct the first trials with a Danish Lynx because of the Danish Lynx community's experience with ship-based helicopter operations. The Visby class was to be fitted with a hangar below the flight decks but that has now been cancelled.

FMV: 1155983

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African countries sign Gulf of Guinea security agreement

DENISE HAMMICK

Ministers of 11 African countries signed a communiqué for a six-point action plan aimed at improving maritime security in the Gulf of Guinea at a US-led conference in Cotonou, Benin, on 15 November 2006.

The document commits to improving maritime domain awareness; strengthening and sustaining political will; strengthening regulatory frameworks; enhancing regional co-operation; enlisting the support of regional and international partners; and raising public awareness.

The conference at which the document was signed — sponsored by US Naval Forces Europe (NAVEUR), the US Department of State and the Africa Centre for Strategic Studies — is part of the African Maritime Governance Initiative, a broader US effort to encourage African countries to take control of their maritime possessions, including oil and fishing stocks, as well as control piracy and human and narcotics trafficking.

Rear Admiral Philip Green, director of Strategy and Policy for NAVEUR in the region, told *Jane's*: "We're all really pleased with the commitment and substance of the communiqué. I think it really shows the strength of political will of the participants."

He added that he thought the most near-term of the objectives the countries would achieve is the commitment to maritime-domain awareness, because it is "the most easily achievable, given the existing technology like AIS [Automatic Identification System]".

As part of the communiqué, the ministers have agreed they will hold meetings every six months to collaborate on ways to improve maritime domain awareness and to update each other on how improvements can be made.

It will now be taken back to the respective governments of Angola; Benin; Cameroon; Congo; the Democratic Republic of Congo; Equatorial Guinea; Gabon; Ghana; Nigeria; Sao Tome and Principe; and Togo for adoption.

See jni.janes.com for more

France closes in on Barracuda order

BY RICHARD SCOTT

KEY POINTS:
- *DCN will co-contract Barracuda with Areva TA.*
- *A class of six Barracuda SSNs is planned, with the first unit to be delivered in 2016.*

Senior officials from French naval shipbuilding, systems and support group DCN expect the French government to sign up for the acquisition of the new Barracuda nuclear-powered attack submarine (SSN) class by the end of 2006.

Michele Alliot-Marie, French defence minister, reaffirmed the government's intention to notify the deal by the end of this year in her address at the Euronaval show in Paris on 25 October.

A class of six Barracuda submarines is planned at a total cost of about EUR8 billion (USD10 billion). However, the programme will be split into an initial contract (*tranche firme*) for the design and industrialisation activities, with contract options (*tranches conditionelles*) to be exercised for the manufacture of each boat.

Displacing 4,765 tons submerged, the six Barracuda-class SSNs will progressively replace the French Navy's six Rubis-class boats. Seen as a key component of the navy's future force projection capability, the new submarines will be equipped with the Scalp Naval cruise missile, together with SM-39 Exocet anti-ship missiles and a new-generation heavyweight torpedo.

"Contract negotiations [for Barracuda] are now at a very advanced stage," Jean-Marie Poimboeuf, DCN's chairman and chief executive officer, told *Jane's*. "We expect notification of the contract by the end of this year, with manufacture activities at our submarine facility in Cherbourg to start in 2007."

DCN, partnered with Areva TA (which is taking responsibility for the nuclear steam-raising plant), has been locked in intense negotiations with the Délégation Générale pour l'Armement (working in conjunction with the Commissariat a l'Energie Atomique) for several months in an effort to secure a design and build contract. This follows the conclusion of definition studies, starting in 2002, which have matured the Barracuda design and through-life support strategy.

"The *tranche ferme*, to be notified by the year's end, will cover the non-recurring engineering costs of the Barracuda design and industrialisation programme, plus long-lead provision for the first of class," said Alain Aupetit, DCN's Barracuda programme director.

He added: "The first *tranche conditionelle*, which we expect in the middle of 2007, will cover the completion of the first boat. Subsequent *tranche conditionelles* will be exercised for each of the remaining submarines on a boat-by-boat basis."

Speaking to *Jane's* at the DCN Cherbourg shipyard, Aupetit said the first Barracuda SSN would be delivered to the French Navy in 2016 to enter service in 2017. "The gap between the delivery of boats one and two will be two-and-a-half years," he added. "After that, we will deliver one boat every two years through to the delivery of the last submarine in 2026."

According to Poimboeuf, the Barracuda programme is strategically important for DCN and the wider submarine supply chain in France. "This contract will underpin our submarine business for the next 15 years. It also gives us and our key suppliers continuity in nuclear-submarine design and manufacture following the delivery of *Le Terrible* [the last Le Triomphant-class nuclear-powered ballistic missile submarine] to the French Navy in 2010."

James Fisher is go with plans to offer international rescue

BY NICK BROWN

James Fisher Defence is to buy up the Royal Navy's (RN's) Submarine Rescue Service equipment and offer a global submarine rescue service to international navies.

Managing Director Simon Harris told *Jane's* that the deal commits the company to take over ownership of the legacy equipment when the new NATO Submarine Rescue System (NSRS) comes on-stream (expected by the end of 2006).

The company is currently the commercial operator and maintainer under contract to the RN.

This equipment comprises: the Scorpio 45 remotely operated reconnaissance and rescue vehicle; LR5 deep-submergence rescue vehicle; a Depressurisation System; Transfer Under Pressure System; and Portable Handling System.

James Fisher Defence: 1155969

UK LR5 deep submergence rescue vehicle prepares for launch.

The LR5 is expected to have another 20 years of life.

The entire rescue system is inherently air-transportable by both military and commercial airlift and could be transported into any theatre around the world within 24 hours.

Harris added that the company may move the equipment from its traditional Renfrew, Scotland home and is currently looking at new basing opportunities that could improve deployability.

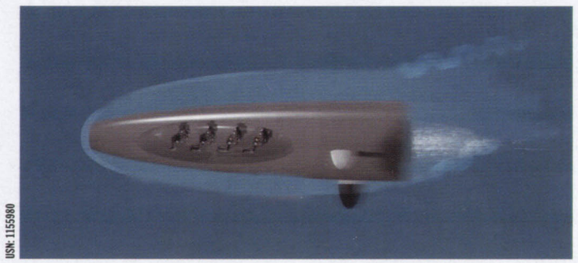
James Fisher is looking to establish standing service contracts with international navies, providing training and availability of the equipment on retainer.

Harris said that the company is currently "talking to a number of navies as potential customers".

See jni.janes.com for more

DARPA study looks into high speed underwater transports

BY DENISE HAMMICK



DSN: 1155980

DARPA's concept for a new supercavitating 'Underwater Express' vehicle.

The US Defense Advanced Research Projects Agency (DARPA) has awarded contracts to Northrop Grumman and General Dynamics Electric Boat to create and demonstrate a high-speed 'Underwater Express' vehicle.

It will be designed with the aim of carrying out high-speed submerged missions using the supercavitation concept, testing the feasibility of the technology to transport high-value cargo and small units of personnel.

Supercavitation offers a 60–70 per cent reduction in total drag on an underwater body, according to DARPA, by either going fast enough to develop a vaporous cavity around itself, or by injecting gas into a partially developed cavity at a lower speed.

"Our goal is to achieve tractable management and control of the dynamics of a supercavitating underwater body so that an eventual system, manned or unmanned, could be envisioned to travel in this state," said the agency in its tender announcement.

Design specifications require an 8 ft-diameter, 60-ton vehicle capable of diving to depths of up to 20 ft, and reach sustained speeds of up to 100 kt for one hour.

A demonstrator model of between a quarter and half scale is to be produced for the final at-sea demonstration — following a series of sub-scale models — during which it must reach top speed for at least 10 minutes and be capable of carrying out 30˚ turns, with only a 10 per cent speed loss.

The final system specifications for the full-scale notional concept craft must also be completed.

DARPA said: "The ability to attain substantial underwater speeds for this class of vehicle is severely constrained by the power required to overcome the large drag forces on an underwater body. Without a radical means to solve this problem, strides that could be made in underwater propulsion are limited, as are breakthroughs needed in underwater sensing, navigation and communications."

Electric Boat President John P Casey said: "This technology has the potential to add significant capability to the [USN's] undersea warfare arsenal."

The contracts are worth USD11 million on aggregate and are due for completion in October 2007.

Drayson backs UK industry over nuclear deterrent

BY DENISE HAMMICK

The UK's Minister for Defence Procurement, Lord Drayson, has spoken to the House of Commons Defence Committee for the first time about a replacement for the UK's nuclear deterrent.

Giving evidence on 21 November, he stated that the indigenous capability to design and build nuclear-powered submarines will be jeopardised unless the government makes a firm commitment to a successor submarine programme to replace the four Vanguard-class boats from about 2024.

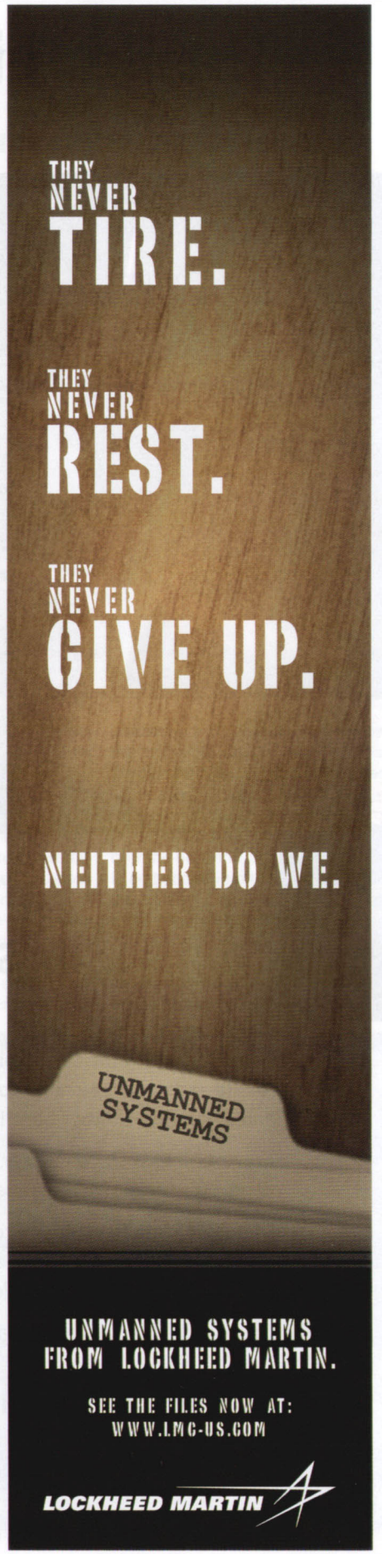
"We cannot expect that the submarine industry could be rebuilt again, so if you want to have a nuclear deterrent [in submarines] in the future, you need to place orders," said Lord Drayson.

"If the Ministry of Defence [MoD] does not maintain a level of orders, industry will decline and the MoD cannot source that [in the future], because we cannot get it elsewhere," he said.

The UK government has yet to decide whether to replace the four Vanguard-class submarines and their Trident D5 strategic weapon system.

It is due to release a White Paper before the end of 2006, which will outline all the options, risks, threats and costs involved in a successor programme.

The release will then be followed by a parliamentary debate and vote, with a decision expected in the new year. This is necessary to meet the anticipated 17-year design and build programme to produce any successor submarine to ensure there is no gap in either strategic capability or skills.



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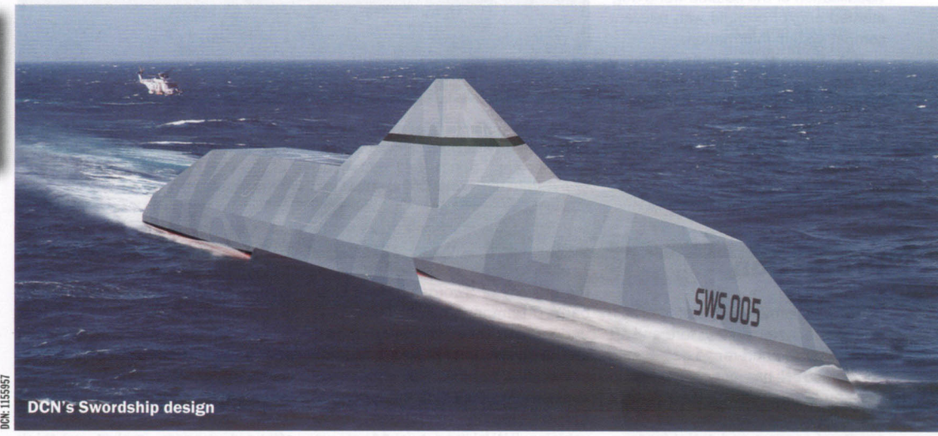
Swordship sets a net-centric course

DCN has developed a novel future warship design intended to synthesise a wide range of emerging platform and combat system technologies. *Richard Scott* examines the innovations incorporated in this radically different surface combatant concept

KEY POINTS:
- *Swordship is characterised as a 'naval network-centric force mode'.*
- *The programme forms a part of DCN's corporate research programme.*



DCN's Swordship design
DCN: 1155957

French naval shipbuilding, systems and support group DCN has revealed details of a futuristic surface combatant concept intended to synthesise a wide range of emerging platform, combat-system, offboard vehicle and networking technologies, which the company sees maturing in the 2030 timeframe.

Operating within a network-centric environment, the design — known as Swordship — is seen as the manned component of a distributed force structure increasingly rich in unmanned vehicles (UXVs) and interconnected by high-bandwidth communications.

Advanced seaframe

Swordship embraces a raft of advanced technologies and techniques — notably an all-composite 'seaframe' integrated sensor and communication array apertures, and an integrated command and navigation environment.

According to Phillipe Goubault, senior naval architect in DCN Ingénierie's ship design office in Lorient, the Swordship concept "establishes DCN's long-term vision of a next-generation surface combatant that is fully net-enabled and exploits a wide range of innovations to operate as part of a wider 'system of systems'".

He added: "With Swordship, we are trying to establish the key areas for our future research and development as part of our corporate research programme. This is a reference tool to help us assess candidate-advanced technology systems."

Displacing 5,300 tonnes fully loaded, and 145 m in length overall, the Swordship 'seaframe' is based on a high-modulus trimaran hullform (featuring a tumblehome centre hull with two slender outriggers) and a low-profile deckhouse to achieve a very low radar cross-section (below a typical sea clutter threshold, according to DCN). As well as being angled to scatter radar returns, the composite structures are designed to allow for the full integration of radar and communications antennas.

For example, a high-frequency over-the-horizon radar linear array is embedded into topside panels on the hull structure. Additionally, satellite communications, S-band and X-band surveillance radars and V/UHF communications antennas are embedded in an enclosed deckhouse and mast structure.

Swordship specifications

Dimensions	
Length (oa)	145.00 m
Beam (oa)	33.60 m
Draught	5.60 m
Displacement	5,300 t fully loaded
Machinery and performance	
Propulsion	All-electric 2 x 21 MW motors
Installed power	1 x 45 MW turbine alternator, 4 x 2.5 MW fuel cells
Speed	30 kt
Range (@ 15 kt)	6,800 n miles
Helicopter operating limit	Sea State 5/6
Endurance	45 days
Complement	
Crew	40
Additional berths	40
Armament	
Triple 155 mm guns	300 long-range guided munitions
Vertical launcher	48 cells
Integrated self-defence	Turrets fore and aft
Asymmetric protection	'Naval Shield' system
Flight deck and hangar	10 t helicopter, 3 x 1.5 t UAVs
Boats	2 x 11 m RHIBs/USVs
Integrated sensors	
Multifunction Radar	S and X band
Navigation Radar	S and X band
HF naval system	Radar and communication
Communications	V/UHF
SATCOM	Military (L, Ku, Ka and C band) Civil (UHF, SHF, Ka and EHF band)

Another innovation is the adoption of an integrated warship management system that combines the traditionally discrete functions of navigation, platform management and combat direction. The concept proposed by DCN would exploit advances in expert systems and virtual reality to reduce manning, and provide the operations team with a 'wraparound' panoramic visualisation of the outside world augmented and/or overlaid with relevant combat system information.

The primary weapons payload comprises a 48-cell vertical-launcher system (capable of firing a range of anti-ship, anti-air, anti-submarine and land-attack missiles) and a triple-barrel 155 mm system. The latter would be served by a 300-round magazine of long-range precision-guided munitions.

DCN: 1194681

The operations room concept exploits advances in expert systems and virtual reality to reduce manning and provide the command team with a 'wrap-around' panoramic visualisation of the outside world augmented or overlaid with relevant combat system information.

Protection

Retractable remotely operated small-calibre gun systems fitted fore and aft would provide short-range defence. In addition, DCN has conceptualised a close-range protection system, called 'Naval Shield', which would combine a suite of sensors and active/passive effectors to provide defence against surface and subsurface targets out to ranges of up to 300 m.

UXVs are regarded as critical to the efficacy of Swordship, said Goubault. "Unmanned vehicles would undoubtedly have a major impact on the operation of this ship. Our initial studies have derived a baseline configuration including three vertical take-off/landing unmanned aerial vehicles [UAVs] and two 11 m unmanned surface vehicles [USVs]."

Hangar space aft would provide for the stowage of UAVs, USVs and a 10-tonne-class helicopter. Embarked aviation assets would be delivered to, or brought down from, the flight deck using a lift; USVs would be launched and recovered through a hatch in the stern.

Goubault added: "The use of UXVs, acting as widely dispersed offboard sensors, makes us think that high speed is not such a priority for this vessel. At this time, we have specified an all-electric propulsion machinery arrangement using two 21 MW high-temperature superconducting motors, driving pumpjet propulsors, to deliver a maximum speed of 30 kt. Of course, we could look at higher speeds if the requirement was identified."

A 45 MW gas-turbine alternator would provide power for operations at the higher end of the speed range. At slower speeds, and/or where acoustic discretion is a priority, DCN believes that 2.5 MW fuel cells could be used to power the electric motors.

Significant effort has also been paid to crew reduction. "DCN already has good experience in designing ships for lean manning," said Goubault. "For example, the Republic of Singapore Navy's new Formidable-class frigates have been designed for a crew of just over 70, not counting the helicopter detachment.

"Swordship takes this experience a step further, introducing greater levels of automation in all ships' departments and exploiting new technology such as remote condition monitoring and automatic fire suppression. Our studies suggest it will be possible to bring the crew down to just 40." ■

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Mistral operation tests out POD limits

The French Navy's first amphibious assault ship to be fitted with podded propulsors carried out operational manoeuvre trials in a recent deployment to Lebanon. *Keith Henderson* assesses the system's performance

France's two new Mistral-class Bâtiment de Projection et de Commandement amphibious assault ships are the culmination of an ambitious design programme and incorporate a number of innovations, including the Propulsor Orientable Drive (POD) outfit.

Although PODs are reasonably widely used in the commercial shipping world — particularly on large cruise ships — the lead ship FS *Mistral* is the first French Navy ship to be fitted with them. As such, the navy is beginning to discover the advantages offered by POD, as well as some of the system's operational foibles.

Mistral was built by DCN and Alstom, who selected the POD outfit as the best fit to meet the navy's requirements of higher availability, lower maintenance, leaner manning, greater manoeuvrability, better architectural flexibility and higher autonomy than conventional systems can offer.

According to the original specifications, the ship must be able to manoeuvre in a harbour without assistance, and get under way and berth with wind speeds up to at least 20 kt, with 25 kt preferred and 30 kt if possible.

Further requirements stated that the ship must be able to stop within five ship lengths and provide a continuous maximum speed of at least 18 kt — with the objective of 20 kt — in less than Sea State 3, 12–15 kt in Sea State 6, and 6–9 kt in Sea State 7 or 8, and be able to sail at very low speed (between 2–5 kt) for days at a time.

DCN: 1155982

***Mistral* was built by DCN and Alstom, incorporating the Propulsor Orientable Drive (POD) outfit, a novel installation in a French warship.**

Precision handling

In addition, the navy stated that the port and starboard propulsion systems must be able to work independently, from minimum to maximum power, ahead or astern and preference would be for proven equipment already in service with commercial ships.

These considerations pushed the designers towards the POD option as manoeuvrability at low speed is better for podded vessels than conventional ones and can be controlled by a very precise dynamic positioning system.

Dynamic positioning is particularly advantageous when operating the flooded rear dock, offering the ability to maintain course without yawing at slow speed, which has proved a real boon for efficiently deploying and recovering small craft.

Even though *Mistral* has not yet been commissioned by the French Navy, it was drafted in for use in operations off Lebanon because the navy needed the substantial capability the ship offered. The operations also required a vessel with flight deck space, long loiter periods and the ability to lift off large numbers of people from an austere setting.

In addition, the excellent manoeuvrability and dynamic positioning capabilities enabled *Mistral* to operate close inshore for prolonged periods and yet rapidly move out of trouble if required. In similar operations to the Lebanese evacuation, previous vessel types would normally stay offshore and only come close inshore for short periods, then return to their stations well off the coast.

A small turning circle is essential to be able to enter small ports, such as those found in Lebanon, and here *Mistral*'s propulsion setup was also proven. The combined 35 tons of thrust of both POD and bow thruster has so far proven capable of balancing a crosswind strength of 15–20 kt, although when manoeuvring care must be taken to account for the strong imbalance between the available thrust of the single bow thruster (20 tons) and the stern mounted PODs (150 tons).

At a cruising speed of 10 kt, the ship's turning circle is less than 500 m and increases to 600 m at 12 kt, but most importantly the ship does not roll when turning, where conventionally outfitted ships roll considerably. This stability is considered particularly important for this type of ship as rolling causes considerable problems with stowing aircraft, cargo and vehicles both below and on the flight deck.

Reliability needs

The navy has discovered that unlike a traditional multiscrew setup, cruising on only one of the two PODs did not offer any advantages. Instead it is better to operate using both PODs running on one generator set. The single diesel electric generator set allows a speed of 10.5 kt to be attained at 95 rpm. This low loading helps to translate into reliability.

Navy experience suggests that the ambitious design objective of seeking availability in the order of 350 days per year seems to be realistic, although temperature in the converter rooms in warm seas is high at 40°C and there is concern this may affect the lifespan of various components.

Another disappointment is that the hoped-for energy savings compared to conventional drives have not been apparent so far and the preventative maintenance schedule for the electric panels is creating a sizeable workload that is higher than estimated.

Away from the technical aspects of the system, there are important changes in training needs that take into account the leaner manning and complex automation of many tasks on board.

The outfit required a change of command culture for the ship, as commands are no longer spoken and relayed. Instead, the commanding officer on the bridge directly controls the propeller revolutions and azimuth direction, requiring a shift in the navy's bridge training process.

As the ship is able to get under way within half an hour — considerably quicker than legacy French amphibious ships — the watch duty roster required significant changes.

It now takes into account the fact that standard operation of the ship requires the maintenance of an organisation comprising several permanently available dedicated teams.

Although *Mistral* does not fully meet all of the navy's expectations — for example the emergency stopping distance of about seven ship lengths exceeds the original requirement of five — the overwhelming benefits of performance regarding manoeuvrability and dynamic positioning of the POD propulsion systems far outweigh the shortcomings.

Following the extended trial period and the Lebanon sojourn, *Mistral* was due to be commissioned in November 2006, with sister ship *Tonnere* expected to be transferred to the navy by March 2007.

***Keith Henderson is the editor of* Jane's Marine Propulsion**

RELATED ARTICLE:

● *Adapting to change: multipurpose French Navy seeks force balance*, **Jane's Navy International**, 1 October 2006.

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Nuclear nations grapple with submarine clean-up

The operational benefits of nuclear propulsion are well established, but as powerful as the capabilities are while the vessels are in service, disposing of them at the end of their lives can prove a real challenge. *Denise Hammick* reports on current strategies

Two defuelled UK nuclear submarines — HMS *Conqueror* and HMS *Warspite* — lie alongside in Devonport, awaiting a final decision to be made on their disposal.

Francis Lewis: 1184672

Public perceptions of nuclear submarine disposal tend to be dominated by the horror stories and pictures of serried ranks of dormant vessels that were widely circulated in the press in the immediate aftermath of the collapse of the Soviet Union. But effectively dealing with reactors at the end of a submarine's life is as big an issue today and is a challenge faced by all nuclear operators.

The US Navy's (USN) Los Angeles-class nuclear attack submarine (SSN) USS *Salt Lake City* was stricken from the fleet for recycling on 3 November 2006, swiftly followed by sister ship USS *Honolulu*. Both will eventually have their reactor cores removed and stored, and hulls cut up so that the high-grade steel can be recycled.

If the breaking of conventional warships is currently proving problematic — because of a lack of facilities, health and safety concerns and burgeoning opposition to the traditional ship-breaking 'graveyards' of India — how much more difficult is the situation for nuclear vessels?

Unlike conventional disposal, the nuclear situation is aggravated by the Nuclear Non-Proliferation Treaty, which constrains opportunities for foreign disposal — and there is little scope for a second-hand market.

It is further complicated by a lack of investment in research into alternative disposal options. Despite the billions of dollars spent on the nuclear industry, no industrial body, government or navy has yet found a "feasible and sustainable solution" to disposing of nuclear waste, according to environmental campaigners Greenpeace.

Added to these environmental concerns about nuclear technology are highly charged technical, financial and political considerations surrounding the commissioning, building and disposal of nuclear-fuelled submarines.

In the late 1940s, when nuclear propulsion technology first came on stream, a UK Ministry of Defence (MoD) official tells *Jane's*, "there were quite enough problems to contemplate at that time without thinking too much about what on earth we should do with [nuclear submarines] when we were finished." But the world's nuclear navies are all now paying the price.

The UK, France, Russia and the US have developed different methods for disposing of their spent submarines.

The major decommissioning process challenge is protecting workers and the environment, while isolating and disposing of the radioactive materials in the submarine: the spent fuel; the reactor and its associated piping; and radioactive liquids.

Other aspects of the process — the removal of equipment, weapons, missile compartments, disposal or isolation of hazardous materials and chemicals, and cutting up the vessel — are shipyard activities typical of the deactivation of any submarine.

Storage of submarines before they reach this latter point has also become important in the last decade, considering the substantial, albeit diminishing, number of Soviet-era submarines still awaiting disposal but stored alongside naval bases in Russia.

Also, the hazardous process of moving

these old submarines from their home port to nuclear breaking yards was highlighted in August 2003, when the Russian Federation Navy's (RFN) Project 627 November-class nuclear attack submarine K-159 came loose and sank while being towed.

The RFN said that the submarine and its reactor were secure, so it was not worth the complication and expense of raising. Therefore, the 40-year-old submarine still lies corroding on the seabed at a depth of 238 m about five miles from Kildin Island near Murmansk.

Even without the costs incurred by having to raise a submarine from that kind of depth, the disposal of a nuclear vessel is an expensive business. The USN is planning to spend in the order of USD30 million deactivating USS *Salt Lake City* alone over the course of a year.

Internationally, several multibillion-dollar bilateral and multilateral deals have been struck to help clean up Russia's nuclear legacy.

One of the most prominent of these is the G8's 2002 commitment to pledge USD20 billion over 10 years, as part of the 'Global Partnership Programme Against the Spread of Weapons and Materials of Mass Destruction', of which dismantling nuclear submarines and cleaning up associated nuclear fuel sites in Russia is one of the main objectives.

Following a period of thorough study and consultation, the UK has opted for secure long-term storage well out of sight

The problems of Russia's nuclear submarine fleet are of particular concern, but all of the nuclear navies face various challenges in the handling and disposal of radioactive waste from decommissioned submarines.

Since the UK's first nuclear-powered vessel — the SSN HMS *Dreadnought* — was commissioned in 1963, the UK has constructed 26 more, including 19 SSNs and seven ballistic missile boats (SSBNs).

After it was decommissioned in 1982, 13 others followed *Dreadnought* out of service and currently lie alongside in Devonport in southwest England, and Rosyth in Scotland, "pending the development of a final disposal solution", a spokesman from the UK MoD's Defence Logistics Organisation (DLO) tells *Jane's*.

As it stands, the UK MoD policy is to "store nuclear-powered submarines afloat, not to dismantle them". This process involves removing the nuclear fuel from the vessels "at the earliest opportunity" and storing the uranium bars in steel flasks before transporting them by rail to the Nuclear Decommissioning Authority's long-term storage facility at Sellafield, in northwest England.

The solid fuel assemblies are extracted from the flasks underwater in a reception pond, and kept submerged and unprocessed in the plant's dedicated military-grade nuclear fuel wet inlet facility, which consists of a large pool with a depth of 4–5 m.

Storing the fuel underwater "maintains [the fuel] at temperature, plus water is a biological shield, which shields workers from radiation and exposure", says a spokesman from the British Nuclear Group (BNG), which operates the site. It was built to house 3,000 fuel modules and is at present about half full.

Including waste from commercial and civil electricity programmes, a Department for Environment, Food and Rural Affairs (Defra) spokeswoman tells *Jane's* that "there are already more than 80,000 m^3 of higher activity radioactive waste and over the next 100 years the UK will accumulate a total of 470,000 m^3 of radioactive waste from activities to which it is already committed, such as the need to decommission existing nuclear plants".

"Some of this material will stay radioactive for millions of years," she adds.

Greenpeace ridicules the idea that there can ever be a solution for submarine fuel disposal, claiming that "reprocessing is another name for nuclear waste dumping".

Following a period of thorough study and consultation, the UK has opted for secure long-term storage well out of sight, in a plan announced by Environment Minister David Miliband on 25 October 2006. He declared that military-grade nuclear waste "should be managed in the long term through geological disposal".

Underground repository

This is defined by Defra as "placing the radioactive waste in an engineered repository at between 200 m and 1,000 m underground, where the rock structure provides a barrier against the escape of radioactivity."

Unsurprisingly, environmental activists question the efficacy of this approach, even in a relatively geologically stable region.

Greenpeace disputes the idea that the rock would be a barrier, claiming "no options have been able to demonstrate that waste will remain isolated from the environment over the tens to hundreds of thousands of years", adding "there is no reliable method to warn future generations about the existence of nuclear waste dumps".

But while a UK site is found, defuelled, laid-up submarines' remaining radioactive material "is securely housed in the reactor compartment [RC] of the submarine", according to a DLO source.

"All the submarine systems are depressurised and drained, including the reactor systems, and all hull openings are secured to prevent water ingress. Preservation and corrosion protection is undertaken to ensure the watertight integrity of the vessel, and an ongoing maintenance regime is implemented to monitor its condition. This has proved to be a safe arrangement for over 20 years," he adds.

Three submarines moored in Devonport — the Swiftsure-class HMS *Splendid*, HMS *Spartan* and HMS *Sovereign* — are currently awaiting defuelling, and these, says the DLO spokesman, are maintained in a similar way to an operational submarine. This includes daily checks for buoyancy and inspection of the submarine for leaks, corrosion and defects, as well as checks to monitor the integrity of the nuclear steam rising plant.

The UK considers the mooring of submarines alongside to be an immediate to short-term solution, but the fleet's decommissioning schedule will likely see the current storage capacity for nuclear submarines run out before 2020.

Since identifying and aggreeing a site site for geological disposal is a considerable way off, an interim solution is being worked through as part of the MoD's internal Project ISOLUS (Interim Storage Of Laid-Up Submarines), which was commissioned in 1998 and has concluded that land storage — with the bulk of the submarine cut up and the RCs stored in complete form or as packaged waste — is the best way forward in the longer term.

This however, will also take some time, as an appropriate land storage site has not yet been identified.

Key events in disposal of a US nuclear-powered submarine

REACTOR DEFUELLING: includes training shipyard personnel, preparing the ship and reactor for fuel removal, extracting the fuel from the reactor and preparing the fuel for shipment to the Department of Energy's expended core facility in Idaho.

SHIP SYSTEM SHUTDOWN: involves the shutting down, laying up, draining, disconnecting or servicing of all ship systems including propulsion, armament, communications, water, steering and diving, and ventilation.

EQUIPMENT REMOVAL: involves the removal of equipment identified for reuse in the active fleet.

MISSILE COMPARTMENT DISMANTLEMENT: for ballistic missile submarines involves removing the section of the submarine containing the missile compartment, dismantling the missile compartment, and rejoining the hull if hull recycling is not taking place concurrently.

PREPARATIONS FOR WATER-BORNE STORAGE: are made if the inactivated submarine is not concurrently undergoing hull recycling. Preparations include establishing a watertight hull integrity that will support a minimum of 15 years of wet stowage.

TOW MODIFICATIONS: are made on submarines not deactivated at Puget Sound in order to tow them there for reactor compartment removal and disposal. Modifications include installing special towing equipment and modifying some ship systems for use during the tow.

Source: US General Accounting Office study 'Nuclear Submarines: Navy efforts to reduce inactivation costs'

UK DLD: 1184673

Moving Russian submarines between Murmansk and Gremika shipyard for dismantling now involves a heavy lift ship, following the sinking of K-159 while on tow.

Laying-up of submarines alongside is therefore likely to remain the solution for the foreseeable future. Over the past nine years this approach has been costing an average GBP1.2 million (USD2.27 million) a year, according to the DLO spokesman.

No up-to-date costs were given for storing spent nuclear fuel at Sellafield, or the annual cost of transporting the fuel, but in 1998, storage was priced at GBP1.4 million and transportation was in the order of GBP200,000.

Disposal procedure

Across the English Channel, the French Navy's first nuclear-powered vessel, the SSBN *Le Redoutable,* began sea trials in 1969. Since then, it and the six in its class have been dismantled, and five are currently undergoing the process.

In France, the dismantling process commences with the nuclear fuel being taken out of the reactor in the military nuclear facilities in Cherbourg, Brest, Ile Longue and Toulon.

A large moveable instrument is used to connect the nuclear section of the vessel to the shore facility to ensure it is airtight, "so in case of incident, there is no physical possibility of external contamination", retired nuclear safety engineer Captain Max Moulin tells *Jane's*.

The used fuel is then "stored in a special pool" and later taken to the nuclear facility of La Hague near Cherbourg, where, as in the UK, the fuel is stored underwater.

No decision has yet been made regarding the final storage or reprocessing of the spent fuel.

After defuelling, the RC undergoes primary decontamination before being cut from the rest of the submarine in a dry dock. The hull is then scrapped, used as a target or in the case of *Le Redoutable,* used as a museum, with a full-size mock-up of the RC.

French defence company DCN dismantles the submarines on behalf of the navy and monitors the reactors once they have been taken to Cherbourg, while the natural radioactivity decreases.

DCN naval architect Xavier Itard says: "The radioactivity is low. We store the [RC] component outside, although it is protected from the elements by a thin wall, until the radioactivity decreases."

His colleague Claude Renard adds that this process can take between 10 to 15 years for the residual radiation to decrease before it can be cut up.

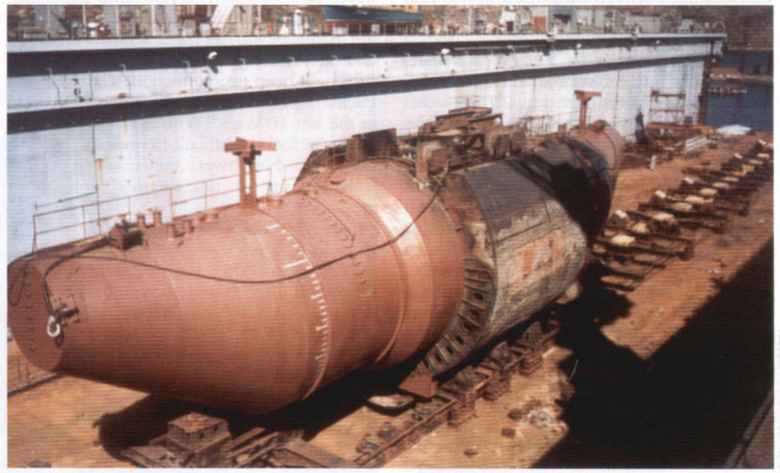
"We have already dismantled the first submarine [*Le Redoutable*], which was covered for more than 10 years. If we are not pressured to do it we prefer to let the radioactivity decrease. What is five more years?"

In 1998, the cost of deactivating, defuelling and removing the reactor compartment of *Le Terrible* was reportedly FFR125 million (USD20.5 million). Current costs are unavailable.

In the Cold War, the Soviet Union's naval strategy rested on a preponderance of submarines and as such, Russia has the biggest legacy fleet to clear up.

The service's first nuclear-powered vessel, hull number K-3 (subsequently named *Leninski Komsomol*), entered service in 1959, and in excess of 250 submarines were subsequently constructed. Many of these vessels were retired en masse in the early 1990s as a result of: either reaching the end of their service life; a reactor incident; the Strategic Arms Limitation Talks; or because of strategic redundancy and financial chaos following the end of the Cold War.

By the mid-1990s, more than 160 submarines retired from the RFN were stored afloat for decades with spent nuclear fuel onboard, in conditions that did not meet



Bellona Foundation: 1184674

An empty reactor section from a dismantled Russian submarine in Nerpa shipyard.

A nuclear submarine awaiting disposal on Russia's Pacific Coast. Although decommissioning work is progressing well on the boats of the Old Northern Fleet, concerns remain about the vessels and fuel storage on the Pacific Coast.

Bellona Foundation: 1184676

the requirements of safety regulations for contaminating the environment.

The resulting international engagement led to the formation of the Contact Expert Group (CEG) under the umbrella of the UN's International Atomic Energy Agency, which advises on the flow of international funds under multilateral and bilateral agreements to Russia to help dispose of its nuclear legacy.

To date, 197 submarines are officially out of service — 120 from the Northern Fleet and 77 from the Pacific — Sergey Antipov, the deputy head of Rosatom, the Russian Atomic Energy Agency, said in May 2006. Of these, he said, 133 have been dismantled, 26 are in the process and 38 are waiting. In total, 49 still contain radioactive fuel.

Funding for all of this work, Antipov added, had been split between Russia (which had spent USD250 million on submarine dismantling between 2002 and 2006) and USD313 million from foreign partners. He added that if all the pledged money arrived and funding continued at a linear rate, plans for Russian nuclear submarine dismantlement should be completed by 2010.

Foreign money is certainly aiding the process and so far the US has funded the dismantling of seven submarines with four more to come, Canada is helping with 12 in total — including a promise of additional assistance — Japan with six, the UK four, Norway five and Italy three.

Under the Common Threat Reduction programme, money from international donors also supports the improvement of infrastructure and equipment to help the dismantling process.

Sergey Bocharov, executive secretary of the CEG, tells *Jane's* that the US had "procured and delivered efficient equipment for recycling of cables and equipment for removal of fuel from reactors to be used for the dismantling of any subs, not just the ones the US were helping with".

Nevertheless, he estimates that it will still cost a further USD200 million to dismantle the remaining submarines — possibly more considering their degenerated state and the potential for damaged or corroded fuel assemblies in the 34 submarines still awaiting dismantling on the Pacific coast.

"The subs at the Pacific, some of them are in quite bad shape because they have spent a very long time in the base waiting for dismantlement," he says.

Watchful eye

Far eastern Russia also suffers from earthquakes, typhoons and tsunamis, which have the potential to wash the decommissioned submarines out to sea.

Nils Böhmer, Russian programme director for the Norwegian-based Bellona foundation, which keeps a watch on Russian nuclear submarine and waste disposal, agrees.

"In the Northern Fleet a lot of attention and interest has been paid by donors a lot of subs have been decommissioned lately. In the Pacific Fleet, almost nothing has happened in the last 10 years." With damaged RCs, he adds, the fuel is "difficult to retrieve".

On the Northwest coast, there is fuel from about 90 nuclear reactors stored at Andreeva Bay, on the Kola Peninsula, which is "more expensive to store than in the laid-up subs".

Böhmer too wants more money focused towards the East Coast, which at the moment only receives donations from the US and Japan. But he would also like to see improvement on the West Coast, starting with a centralised storage facility for laid-up submarines on the Kola Peninsula so they can be properly monitored.

At the moment, Böhmer tells *Jane's*, nuclear submarines are taken from their respective home ports to the Nerpa, Polyarny and Severodvinsk ship-breaking yards. They are transported by a heavy lift vessel funded by Canada, Norway, Russia and the UK, which keeps the submarines above the waterline — as towing was banned following the K-159 sinking.

Once at the shipyards, the spent nuclear fuel is extracted, put into a TUK-18 transport cask and transported by service ship to Atomflot in Murmansk. There it is stored in a land-based storage site until it can begin the 3,000 km rail journey to the Chelyabinsk-65 (Mayak) storage and reprocessing plant in the Ural region.

This journey is beset with potential problems, including a lack of containers, service ships, or the money to finance the rail journey; all of which have stopped the fuel being extracted or transported in the past. For instance, during 2000, Bellona reported the reprocessing line at Mayak ground to a halt for many months because the storage space for spent nuclear fuel was full to capacity.

But when reprocessing begins at Mayak, Böhmer says: "The metallic spent fuel is dissolved in acid, and at this moment transferred to a liquid state. From this liquid, uranium and plutonium is extracted, and the remaining liquid high-level radioactive waste is transformed into glass blocks and stored… in big underground tanks.

"The equipment is not working well," he adds, referring to the furnace that mixes the liquid nuclear waste, sand and glass to produce the solid blocks, "and needs to be replaced regularly, which costs money they do not have. A lot of the waste is left in tanks in liquid form." The RC goes instead to Sayda Bay, where an onshore storage facility has recently been built.

"There is no roof, just a concrete pad," he says, telling *Jane's* that the Russian government was following the blueprint of other countries, but not necessarily making allowances for the harsh Arctic weather.

"You are supposed to be able to store the sections for 70 years. They do inspections and paint the sections with a special coating, which they say is good for 20 years. Whether or not that is true we will have to wait and see, but at least they are in a more controlled environment than the sea. It is easier to detect any increase in radioactivity… and you do not have the risk it could sink."

Dismantling expert

On the other side of the Atlantic, the US has the longest period of continuous experience dismantling nuclear vessels. The first US nuclear-powered vessel, the submarine USS *Nautilus*, went to sea in 1954, and in 1969, USS *Triton* was the first to be decommissioned.

By 1990, only 24 were out of service, but the end of the Cold War, budget constraints, block obsolescence of the first generation of SSNs and the lowering of the SSN force-level goal from 100 boats to 55 under the 1993 Bottom-Up Review, led to an accelerated retirement of older classes of SSNs and retirement of front-line Sturgeon and Los Angeles-class submarines in lieu of costly overhauls and refuelling.

"To date, 124 nuclear powered ships have been inactivated, 115 reactor compartments have been removed, 41 missile compartments have been dismantled, and 108 submarine recyclings have been successfully accomplished," a US Naval Sea Systems Command (NAVSEA) spokesman tells *Jane's*.

Currently, retired submarines get defuelled and deactivated at five nuclear-capable shipyards: Norfolk Naval Shipyard, Virginia; Portsmouth Naval Shipyard, Maine; Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility (IMF), Hawaii; Puget Sound Naval Shipyard (PSNS) and IMF in Washington; and the commercial shipyard Newport News.

But PSNS and IMF are the only shipyards to "perform all disposal and recycling operations, including packaging and transport of the nuclear reactor compartments," says the NAVSEA spokesman.

Currently, 13 SSN hulls and two nuclear-powered cruisers are laid-up at PSNS and IMF awaiting disposal, after being towed there from the respective inactivation yards. They are maintained in wet storage, unless they are scheduled to be recycled shortly, in which case they are taken to dry dock.

During inactivation, the weapons and expendable materials, sensitive equipment and the main battery are removed. All the pipes and tanks are then drained and flushed, the electrical and lighting systems de-energized.

The hull is therefore ready, when placed in the dry dock, to be cut. In the US, as in France, a refuelling enclosure is installed "over the hull above the reactor compartment to provide a controlled work area with filtered ventilation".

"Fuel is removed into a shielded transfer container, which is then moved by crane to a dockside enclosure [and] placed into a specially designed shipping container."

The reactor compartment is then separated, drained and sealed and an additional bulkhead is added to provide "a redundant containment boundary", the NAVSEA spokesman says.

After the reactor compartment has been separated, drained and sealed, it is moved onto a reinforced ocean barge using track-mounted, high-capacity rollers and large hydraulic jacks, before being welded to the steel barge deck.

The barge is then towed into the Strait of San Juan de Fuca, accompanied by a navy or coast guard escort vessel, down the Washington state coast and up the Columbia River to an unloading point at the Port of Benton. It is then towed the 25 miles on a trailer for shallow trench burial at the Hanford nuclear reservation.

In 1986, the first reactor compartment was shipped to Hanford, and by 1998, 71 reactor compartments had been buried there. It was not possible to verify how many hulls are there today. The spent nuclear fuel is sent in a shipping cask by rail to Idaho National Engineering Laboratory.

Up until April 1992, the Department of Energy (DoE), which operates the site, reprocessed more than 100,000 metric tons of heavy metal there to recover the fissile material for reuse, but that was stopped, according to a 1995 DoE Environmental Impact Statement (EIS), because "the end of the Cold War has sharply reduced the need for special nuclear materials". Instead the department "currently stores most of the fuel in 10- to 40-year-old water pools [designed for temporary storage of spent nuclear fuel until it can be reprocessed]".

The same 1995 report also stated the DoE's decision for liquid high-level waste was to "convert it to calcine [a stable, solid waste form]", and anticipated that 100 metric tons of heavy metal — both commercial and military — will be generated over the next 40 years.

Over the same period, an alternative interim or even final storage site will have to be found where the spent nuclear fuel can be stored, as a result of the DoE and USN being taken to court by the governor of Idaho in 1993, who claimed the state was becoming a de-facto permanent repository for spent nuclear fuel.

The court ruled that all spent naval fuel will have to be removed from Idaho by 2035, and like the UK, the US also plans to geologically dispose of its waste, although it too has yet to identify a site.

The cost involved in dismantling these submarines and processing the fuel is significant. A NAVSEA spokesman tells *Jane's* that "reactor compartment disposal and hull recycling of a typical submarine costs approximately USD20 million".

Nuclear ambition

Despite the cost, technical and environmental concerns surrounding the disposal of nuclear submarines, the operational benefits of stealth, speed, endurance and range ensure that navy requirements for nuclear boats remain undented.

In fact the USN is once more building up its SSN fleet and is to commission eight of its nuclear-powered Virginia-class submarines. The RFN is building a Project 885Yasen-class nuclear submarine RFN *Severodvinsk*, which is due for commissioning in 2008. Similarly, a Project 949B and Project 941Antyey (Akula) class submarine are also due for commissioning over the next two years.

France is currently building the SSBN *Le Terrible*, which is due for commissioning in 2010, and is expected shortly to place an order for six Barracuda-class SSNs.

The UK is also building SSNs, with three Astute class due for commissioning between 2009 and 2012, although it has not yet been decided whether the four Vanguard-class SSBNs will be replaced when they reach the end of their service lives in the 2020s.

China is expanding its relatively new nuclear submarine fleet — with no boats due for disposal any time soon — and is expecting four more to be commissioned over the next four years.

Disposal of nuclear submarines and their waste is likely to remain a pressing question for some time to come. ■

A Russian Delta-class submarine is dismantled at Zvezdocjka shipyard in Severodvinsk.

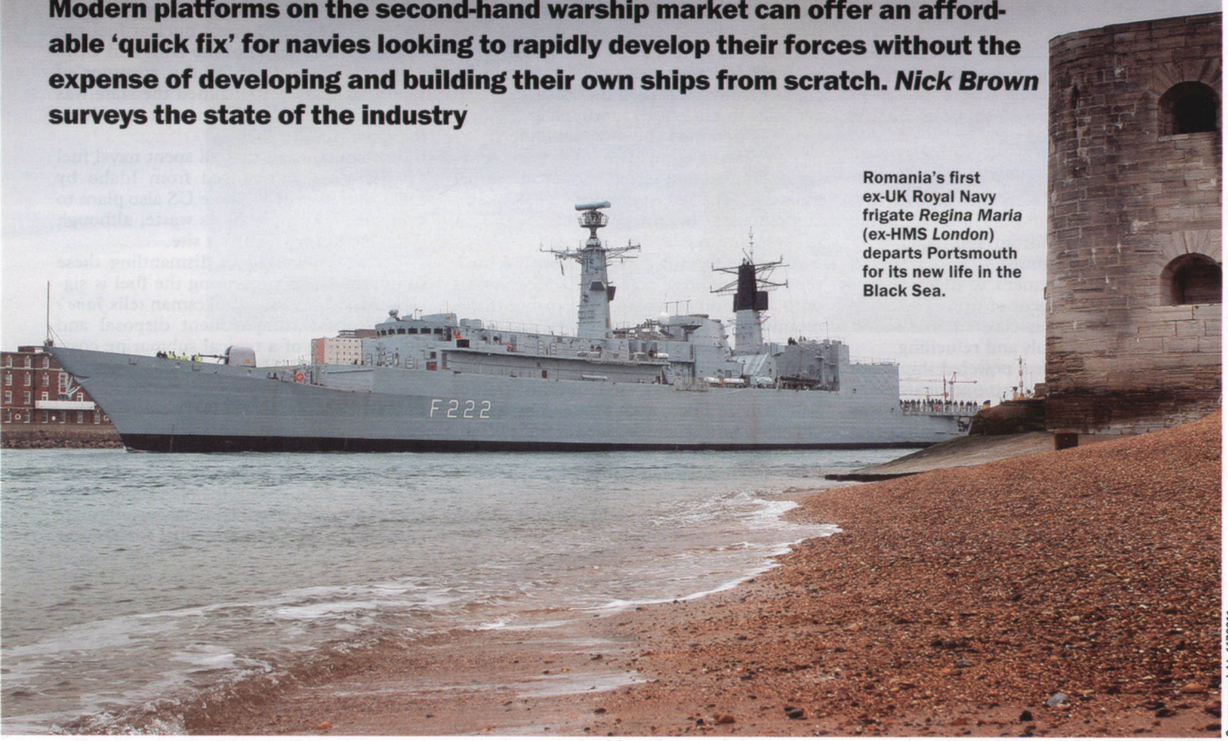
Contact Expert Group, IAEA: 1184675

RELATED ARTICLES:

- *Can UK nuclear submarine industry retain critical mass?* **Jane's Navy International**, 22 June 2006.
- *The Lasting Legacy – nuclear submarine disposal*, **Jane's Navy International**, 1 January 1998.

Life after retirement — the second-hand warship market

Modern platforms on the second-hand warship market can offer an affordable 'quick fix' for navies looking to rapidly develop their forces without the expense of developing and building their own ships from scratch. *Nick Brown* surveys the state of the industry



Romania's first ex-UK Royal Navy frigate *Regina Maria* (ex-HMS *London*) departs Portsmouth for its new life in the Black Sea.

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For developed navies around the world, the fallout of the Cold War brought a difficult period of retrenchment and downsizing — known as the 'peace dividend' in the UK — which resulted in a brimming second-hand warship market as navies found themselves tightening their belts and under pressure to divest themselves of expensive, manpower-intensive platforms.

Though this was undoubtedly a painful period for those forces, the opposite was true for the customers: if they had the money, the platforms were available to help develop their forces in a hurry, whether they were looking for Soviet-era vessels or surplus US frigates.

Although the ex-Soviet fleets have to a large extent now either been winnowed down through vessel transfers or become a less attractive sales proposition through age and lack of use, the market has seen its fair share of surplus Western European and US platforms changing hands in recent times as a second round of fleet recapitalisations over the last five years has seen the market enter another period of rude health.

The general trend for Western navies to shrink their remaining Cold War-legacy fleets to refocus on expeditionary warfare — with several major programmes underway to build new multipurpose hulls capable of operating in the littoral — has seen a range of very capable vessels be snapped up on the open market or recently become available.

Market availability

Jurrien Noot, editor of *Jane's Naval Construction and Retrofit Markets*, concurs. "Previously most of the second-hand market was taken care of by the US and the Soviet Union; now Russia has hardly any available.

"In recent years it so happened that a fair number of modern European units became suddenly available for transfer. This was at least in part facilitated by defence transformation following the Cold War and adapting to new peacekeeping and peace enforcement by some European countries."

This picture has been underpinned by the expansion of NATO, which required the new members to rapidly build up their NATO-standard forces.

The quickest and simplest way to do that for many was to seek out these proven, but now surplus, second-hand fleet workhorses, such as Romania's acquisition of two ex-UK Royal Navy (RN) Type 22 Batch 2 frigates in 2005.

The deal was marred by investigations into claims of impropriety in mid-2006, but the project nevertheless saw the successful regeneration and activation of two proven NATO-standard frigates.

It was an interesting example of the possibilities of the market, as the two frigates — HMS *Coventry* and HMS *London*, now *Regele Ferdinand* and *Regina Maria* respectively — paid off in January 2001 with more than half their planned life remaining and swung on a buoy in Portsmouth until the GBP116 million (USD206 million) transfer deal was signed in January 2003.

According to an industry source, "in general terms, a 'hot transfer' is the ideal solution, where you swap one active crew for another. The longer you leave the vessel inactive, the more of a headache it can be returning it to active duty.

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USS *Black Hawk*, one of the relatively new Osprey-class mine-hunters up for sale, victims of a changing doctrine.

US Navy: 0016486

Combat Camera: 1155996

The undiginified arrival of the fire-damaged HMCS *Chicoutimi* to Canada.

"Nothing is impossible, however, and a ship is rarely too far gone for us to have no hope of reactivating it if a customer is found. The hulls can stay viable long after they appear messy to observers on the outside. The limiting factor is structural integrity, because everything else you can replace, within reason. Although there is obviously a cross-over cost point, where you may as well just build a whole new vessel".

The amount and depth of work needed to get a vessel back into working order can depend on the level of preparation and maintenance imposed.

The source explained that in the UK, the level of preventative measures and maintenance to be undertaken are based on a survey and analysis of the potential future of the vessel. For example, if a buyer is found while the ship is still active, a hot transfer can potentially be arranged.

If there is a good chance of disposal, but the customer needs to train up crew or for some other reason is unable to take over direct ownership, the UK Ministry of Defence (MoD) will take a number of steps, such as shutting down systems, draining the relevant fluids, spraying rust-preventative treatments and plugging in dehumidifiers around the deck and inside the hull, to ensure that the vessel stays in a reasonable condition. The vessel will then be regularly surveyed and minor maintenance carried out as necessary.

In most cases, the vessels are usually stored 'dead', with no onboard power, and so need to be alongside to feed the dehumidifiers and other systems, taking up valuable pier-side space.

Alternatively, if the surveyors decide that the vessel is destined for the scrapyard, there will be no preservation at all and the vessels will tend to rapidly deteriorate.

"Even with preservation methods in place, a vessel can go downhill quickly," the source continued. "From a simplistic point of view, things like hinges and hatches will seize up if not used, but the main problems are electrical, rather than mechanical. The internals of a modern warship rely heavily on myriad complex electronic systems and condensation in the racks can be a major, major headache."

Corrosion issues are relatively easy to deal

Richard Scott/NAVYPIX: 1155995

HMS *Norfolk* undergoes overhaul and refit work in dry dock, before handover to the Chilean Navy.

with, but the rapid pace of technology development in the electronics world can greatly complicate the issue. Obsolescence is a far graver concern than replacement.

This is not only based on system integration and retrofitting — it can prove problematic installing even relatively simple equipment like a new digital gyroscope into an old analogue navigation system — but also because legacy systems often use proprietary (and potentially no-longer supported) interfaces and software.

A spokesman for FSL told *Jane's* that "the result for the contractor is often a painstaking search for replacement parts, particularly when manufacturers have gone out of business, have been taken over or have ceased production of parts that they consider to be old technology".

If a navy has discovered this lack of availability of parts and support first-hand, then it often exacerbates the issue for future reactivation because of the natural process of routine scouring of decommissioned vessels to keep active sister ships in service.

Fighting obsolescence

In the US, concern that this process of robbing decommissioned ships was becoming systematic led to the office responsible for naval vessel transfers, PMS 336 under the Program Executive Office Ships, setting out a direct responsibility to "ensure vessels designated as [Foreign Military Sales] are not stripped or otherwise degraded except as specifically authorised by the [Chief of Naval Operations]".

The US Navy (USN) decided to effectively outsource all of its used warship reactivation/regeneration to industry in 1995 and, just over a decade later, VSE Corporation has managed work on 30 transfers and is still carrying this out.

Its latest high-profile contract resulted in the successful regeneration of the four Kidd-class destroyers brought out of mothballs for Taiwan, after the US government declined Taipei's request for Aegis vessels.

Since the first-in-class, USS *Kidd* (now *Keelung* in Taiwanese service), retired in 1998 and the youngest ship, USS *Chandler* (now *Makung*), in 1999, the project involved a great degree of reactivation work. VSE estimates this as taking 168,300 mandays to rework the necessary 14,600 industrial items.

This included substantial repairs and equipment overhauls just to get the basic vessels back up and running. But the obsolescence issue also raised its head during upgrade work to get the ships up to New Threat Upgrade (NTU) standards — basically the ability to launch and control the Standard Missile 2 Block IIIA air-defence missile.

The last ship fitted with systems of the NTU standard in US service retired in 1999, forcing VSE to resort to "exceptional ingenuity to ferret out sources of repair parts and find people with the requisite skills to reactivate the ships' systems", according to a company statement from the 21 September 2006 handover to Taiwan.

In most recent warship transfers, the vessels and systems in question have been relatively newly out of service, so the operator communities have been reasonably fresh; but this 'skill fade' issue poses a potentially huge setback for warship reactivation.

A USN source told *Jane's* that "if you've ever played with an old PC and had to remember your way back through three or four versions of operating systems, you'll get some basic idea of the kind of problem. Even Windows 3.1 can blow your mind when you're used to XP".

As it was on the Kidd-class transfer, VSE managed to assemble a 50-strong team of ex-USN personnel with an average of 20 years' experience to get the systems up to speed, and then taught 4,625 classes over 19,574 instructor and 156,247 student hours.

Richard Scott/NAVYPIX: 1155998

The second ex-UK HMS *Norfolk* to be acquired by Chile — the first being a County-class destroyer transferred to Chile in 1982. This one, renamed *Almirante Cochrane*, a Type 23 frigate, was handed over to Chile on 22 November 2006.

Substantial integration

Back on the Romanian ships, the reactivation programme was also extensive and by the time *Regele Ferdinand* was handed over to its new owners on 9 September 2004, the ship had undergone installation of reconditioned Rolls-Royce Tyne and Olympus marine gas turbines, a first-phase combat system modernisation involving the regeneration and modification of the CACS-1 command system with a new CACS/NAUTIS interface.

It also saw a new gun installation along with a new NAUTIS fire-control system, interfaced with a Radamec System 2500 electro-optical director, a BAE Systems Avionics MPS 2000 message-handling system, an IFS Defence computer-based maintenance management system, and a GMDSS/Inmarsat-B and Sperry Marine LMX 420 GPS navigation system, amongst other work.

In addition, various pieces of equipment were removed from the ships, in line with export controls and a drive to maintain a degree of commonality with existing Romanian systems. These included the GWS 25 Mod 3 Seawolf system and the Outfit DLB NATO Sea Gnat decoy-launcher system. The two frigates were also transferred without a surface-to-surface guided weapon (the GWS 50 Exocet missiles fitted during their RN careers having been removed).

These and other UK fleet reductions have also paid dividends for the UK defence industry, which has benefited from these surplus UK vessels continuing their service across the world.

Amongst these, the announcement that the RN was also to retire three relatively young Type 23 frigates under mandated Force Level Reductions in 2004 was happily greeted by Chile, which rapidly acquired the vessels.

Under the deal, the country also awarded a refit and overhaul to BAE Systems Customer Solutions and Support, which has been effectively acting as the UK's ship sales re-activation and regeneration agency.

As with other deals — the Romanian frigates and a September 2006 sales agreement signed with Estonia for three Sandown-class minehunters for example — BAE Systems has also provided training packages from its Flagship Training arm, backed up by certification and support from the RN's Flag Officer Sea Training organisation.

Another navy whose surplus ships are

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Portugal's NRP *Joao Belo*, which is paying off to make room for two Dutch Karel Doorman-class frigates.

finding international favour is the Royal Netherlands Navy (RNLN), which has continued a long run of success disposing of frigates and destroyers, recently selling off ships to Chile, as well as to Portugal and Belgium.

In fact Chile has been one of the biggest second-hand buyers over the last five years and even took shipbuilders aback by cancelling a USD900 million new-build programme in favour of recapitalising with ex-UK and ex-RNLN vessels, estimating savings in the order of several hundred million dollars by doing so.

Chile has signed for four Dutch frigates — two Karel Doorman-class and two Jacob van Heemskerck-class vessels — with another two Karel Doormans each destined for Portugal (in December 2008 and November 2009) and Belgium (in March 2007 and March 2008).

Crew training requirements saw the Chilean Navy establish a small centre inside the Dutch naval base at Den Helder in June 2004, accommodating 300 officers and ratings being trained on the new platforms and systems.

Portugal's Dutch acquisition was selected over a US bid of Oliver Hazard Perry-class frigates and will replace the two ageing Joao Belo-class frigates currently in service. In turn these vessels will trickle on to the used market and a Uruguayan ministry of defence and navy delegation has visited Lisbon to assess the vessels. As Uruguay already operates the type, a deal would make sense.

According to the Dutch ministry of defence, the proceeds from the Portuguese sale will be used to help fund procurement of four new patrol ships for the RNLN, a contract for which is planned to be awarded in April 2007.

Export control

As major arms sales, warship transfers are naturally fairly visible — certainly surface vessels are — not to say high-profile, and are constrained by a network of legislation and arms control obligations. These can last the life of a vessel and are traditionally imposed onto third-party sales, so when Greece offered up four of its ex-RNLN

US Navy: 1184683

USS *Trenton* prepares to depart for operations off Lebanon earlier in 2006. India intends to take over the vessel in a hot transfer at the beginning of 2007.

Kortenaer-class frigates (locally known as the Elli class) to Pakistan earlier this year, it had to obtain approval from the Netherlands first.

D van Dord, the Netherlands' Defence Materiel Organisation's project director general, told *Jane's* that "the end-use statement is a traditional clause in the transfer agreements. This means that the buying government declares that it shall not, for whatever reason, transfer the ship to any other government or third party without the prior written consent of the Netherlands and/or other governments, where applicable".

This latter concerns onward sales of systems fitted to a particular warship, which the manufacturing country reserves the right to veto or demand removed before transfer to a third party, on diplomatic or technology-transfer grounds.

Van Dord added that "the Netherlands has signed an end-use statement for most of the materiel [fitted to its own ships], therefore we also have to obtain approval from the country of origin to sell the materiel. Some countries, such as the US request a direct end-use statement from the new owner".

Buyer beware

Despite the second-hand shopper's dictum of *caveat emptor*, not all transfers go according to plan or to the buyer's desires and what looks like a bargain may turn out to be something less than that.

Witness Australia's acquisition of two ex-USN Newport-class landing ship tanks, which required extensive remanufacturing before handover to the Royal Australian Navy.

Canada has also had a less-than-blissful reception of the four relatively unused Upholder-class diesel-electric submarines from the UK, turning to the second-hand market as a means to quickly fill a capability gap.

The boats were early victims of a UK post-Cold War defence review, retired from active service in 1994 and stored alongside until 1998, when Canada signed them up as replacements for the ageing Oberon class.

Since then, the class has suffered from dents discovered after delivery, a fire in transit and various other issues that have ensured a stormy reception from the Canadian public. Indeed the latest announcement involved the fire-damaged HMCS *Chicoutimi* being taken out of the water and preservative treatments enacted to hold the boat over until the integration of repair work into the scheduled Extended Docking Work Period (EDWP) scheduled for 2010.

This will seriously impact on the force's submarine readiness plans, because the service's strategy was to guarantee availability by employing two boats off each coast. But with the other boats consecutively undergoing their own EDWPs, the force will only muster a maximum of two boats in the water at any one time and the eldest of the boats — *Chicoutimi* — is already 20 years old.

That said, there are some apparent bargains on the market, including the USN's Osprey-class minehunters, which are all paying off, despite the youngest only having been commissioned in May 1999. The victims of a doctrine and technology shift, the task-dedicated Ospreys no longer fit into the USN's plans to provide in-stride mine-countermeasures with helicopters and unmanned offboard systems.

As such, they have a lot of life left in them and four of the class have already been earmarked for Greece and Egypt.

Some craft, naturally, are very difficult or even impossible to transfer, not least nuclear-powered vessels, constrained as they are by the nuclear Non-Proliferation Treaty. But deals governing other, seemingly unsaleable, vessels have come good over the last few years, including India's eventual signature for the ex-Russian aircraft carrier hulk, *Admiral Gorshkov* in 2004.

The trials and tribulations surrounding this particular transfer are legion and widely known, but it is nevertheless indicative of demand in the marketplace, even for ambitious projects such as this. In a similar vein, the People's Republic of China's Liberation Army Navy is apparently continuing to work on the ex-Russian aircraft carrier, *Varyag*, after the 2005 dry-docking of the hulk in the naval dockyard at Dalian.

Even so, some vessels such as the USN's ex-Spruance class appear to be resolutely unmarketable; despite many offers to navies around the world, the class still rests unsold in the US.

The UK has also had great difficulty in finding a home for some of its hulls — the two amphibious assault ships HMS *Fearless* and HMS *Intrepid*. Though now old and having seen fairly hard use throughout their life, the UK MoD was confident of securing a buyer for them. However, this buyer has proven elusive and the ships are still deteriorating, swinging on a buoy in Portsmouth.

Other seemingly worthy vessels like the UK's Type 42 destroyers awaiting disposal in Portsmouth are apparently victims of the market, with other, more attractive vessels crowding them out.

The USN has had more luck with its Austin-class landing platform dock (LPD), USS *Trenton*, which is due to be handed over to the Indian Navy in January 2007 (sister ship USS *Ogden* has been offered to Mexico).

Aiming for a hot transfer, India currently has personnel undergoing training at the USN base at Norfolk, Virginia, looking to take over from the last USN crew and sail the vessel back to India by May 2007.

Although the Indian Navy is a long-standing consumer of second-hand warships, this latest acquisition surprised some naval analysts because of the vessel's age and the fact that India has recently been making a concerted effort to build up its indigenous shipbuilding capability and recapitalise its fleet on mostly Russian and indigenous new-build ships.

However, the service is to use *Trenton* to build up its amphibious capabilities and gain experience working with an LPD. It also plans to use the ship as a design study, to possibly inform future indigenously built amphibious ships.

Learning opportunities

In this way, vessel transfers can provide a much needed insight into warship use and design for a developing navy. But for the vendor country they can prove a short-term fillip and an inadvertent shot in the foot, if indigenous yards can then successfully build their own similar vessels.

Nevertheless, it is a stated aim of the US PMS 336 to "satisfy defence requirements of allied and friendly countries".

After all, if a home cannot be found for a used vessel, there are precious few options left open for its disposal. There is a demand for high-quality steel on the scrap market, but shipbreaking is becoming a difficult and expensive business to take advantage of.

Where a sale is often a source of income (if only marginal), shipbreaking bills are increasing in the face of constricting environmental legislation. The decommissioning of the US Belknap-class cruiser USS *Sterett* cost the Maritime Administration (MARAD) USD2.5 million.

Other than that, MARAD has only identified three alternative methods of disposing of second-hand warships, of which the administration has a substantial backlog. These state that vessels can be sunk in deep water during exercises — provided they have been partially dismantled at cost to be environmentally safe (*Sterett*'s sister ship USS *Horne* cost USD750,000) — sunk in shallow water as artificial reefs (again after environmental breaking), or donated to non-profit organisations such as museums.

In most cases, the best outcome is generally that a developing navy takes advantage of the global second-hand fleet (and thereby takes on the burden of eventual disposal). But with so many capable vessels around it is a buyer's market, and some ship classes are becoming increasingly unappealing or have retired from service at the wrong time, missing their chance of another life. ■

Jane's: 1132352

Two of Chile's new second-hand buys, the ex-Dutch frigates *Almirante Blanco Encaladas* (left) and *Almirante Latorre*.

RELATED ARTICLES:

- *Portugal signs RNLN frigate deal*, **Jane's Navy International**, 2 November 2006.
- *India prepares for amphibious ships*, **Jane's Navy International**, 24 October 2006.
- *Jane's Naval Construction and Retrofit Markets* (jnc.janes.com).

HMS *Fearless* and HMS *Intrepid* ride at anchor waiting forlornly for a new owner.

Denise Hammick: 1155999

Secure seas: Australia ups its maritime patrol efforts

Australia's vast coastline and territorial waters are an economic boon but pose an operational challenge to the country's maritime patrol assets. *Ian Bostock* surveys the country's attempts to seal up its maritime borders

When a hugely overcrowded fishing boat put out a distress call in August 2001, it unwittingly set in motion a chain of events that would thrust one of the responding rescue vessels — the Norway-flagged container ship MV *Tampa* — and Australia's seaward approaches into the international spotlight.

Tampa recovered more than 400 mostly Afghan refugees and steamed for the nearest land, Australia's Christmas Island, but was refused entry on arrival, whereupon a widely reported stalemate ensued.

After several twists and turns, the incident ultimately resulted in the Border Protection Bill 2000, which empowers Australia to remove 'undesirable' vessels from its territorial waters and stipulates that asylum seekers can only claim protection on actually reaching the Australian mainland, rather than any of its outlying islands.

The fallout from the Australian government's response to the '*Tampa* incident' has done much to stem the flow of illegal immigrants seeking to reach the Australian mainland by boat over the past several years.

While the arrival of illegal immigrants from the Middle East, Afghanistan and south Asia was effectively halted, 43 illegal immigrants from the troubled Indonesian province of West Papua slipped through the net and landed in Cape York, far north Queensland in January 2006.

Despite 42 of those 43 being granted temporary protection visas, Canberra's response — nudged along by persistent protests by Jakarta, fearing a repeat of the East Timor breakaway in 1999 — was swift. In April, a new northern border security initiative to shut the door on further West Papuan arrivals was planned.

Together with a review of existing arrangements governing refugee determination (including the application of the 1951 Refugee Convention) and the passing of new regulations that will now see all illegal immigrants who land on the Australian mainland deported to offshore processing centres, a large-scale maritime operation was launched following approval from the cabinet's National Security Committee in mid-April this year.

The multi-agency effort involved satellite and radar surveillance, patrol boats, warships, fixed- and rotary-wing aircraft and submarines to detect and track refugee boats and smugglers off the southern coastline of West Papua.

ADF: 1155974

Lead ship of the RAN's new Armidale-class patrol boat in waters off northern Australia.

Australian Customs Service: 1155975

Customs officers board a small fishing boat on a remote shoreline in northern Australia. Australia faces concerns over the transfer of diseases such as foot-and-mouth to mainland livestock from illegal landings.

But it is the crackdown on illegal fishing in Australia's northern waters — stretching from the Indian Ocean in the west, north to the Timor and Arafura seas and east to the Torres Strait — that is now the focus of Canberra's attention.

Commencing with a separate two-week surge campaign in the same month as the immigration mission, Operation 'Breakwater' netted 23 illegal fishing vessels, 197 crew, 58 tonnes of fish and 250 kg of shark fin. Of those vessels, eight were large Indonesian-flagged 'iceboats' and 13 were shark boats.

These add to the 81 boats already seized in waters to the north since 1 January 2006. As of late August 2006, a total of 244 vessels had been apprehended in Australian waters. This figure includes a large Indonesian-flagged steel-hull stern trawler found with 15 tonnes of reef fish on board.

Last year, a total of 607 illegal fishing vessels were apprehended in northern waters, compared to 289 in 2004. In 2004–05, the Australian Customs Service alone boarded more than 539 suspect vessels of all types.

'Breakwater' saw Customs use the chartered *Oceanic Viking* to temporarily accommodate illegal fishermen before they were transferred to port. In late September the previous year, the 105 m-long *Oceanic Viking* was instrumental in apprehending three of four large iceboats with a combined total of more than 15 tonnes of fish on board. Earlier that same month, the ship was involved in the boarding of the Cambodian-flagged FV *Taruman* northwest of Macquarie Island in the remote but resource-rich Southern Ocean.

The operation also marked the first time that Customs had made co-ordinated use of commercially chartered tug boats to tow apprehended boats into port.

Nevertheless, Defence Minister Dr Brendan Nelson warned in February this year that more than 140 illegal fishing vessels had built up in the Arafura Sea just outside the Australian Exclusive Economic Zone, waiting to poach Australian fish stocks.

Recognising the need to further seal off Australia's porous northern borders, the Howard government nominated illegal foreign fishing and people smuggling as threats worthy of additional resources in the 2006–07 Federal Budget handed down in May.

In addition to resources provided to enable the continuation of border protection operations and activities already under way, funding was set aside for a range of new initiatives to further strengthen the government's ability to detect, deter and respond to illegal activity both around and within Australia's borders. These include:

- funding of AUD95.6 million (USD 73.9 million) over four years to enable the Royal Australian Navy (RAN) to operate two Huon-class coastal minehunters in the surveillance and patrol role across designated high-threat maritime approaches;
- an additional AUD20.2 million to enable Customs to increase the number of surveillance flights over the high-threat approaches to Australia's north by 2200 hours; and
- funding of AUD12.1 million in 2006–07 to continue Operation 'Relex II', which will enable the continuation of naval and air activities to detect and deter unauthorised arrivals across Australia's northern approaches.

Illegal fishing is being tackled via a AUD388.9 million plan directed at the waters across the north. Under an integrated whole-of-government plan, Customs; the Australian Fisheries Management Authority; the Australian Quarantine and Inspection Service; the Department of Agriculture, Fisheries and Forestry; the Department of Defence (DoD); the Department of Immigration and Multicultural Affairs; the Great Barrier Reef Marine Park Authority; the Attorney-General's Department; the Australian Federal Police (AFP) and the Commonwealth Director of Public Prosecutions will all be provided with the resources to more than double the number of illegal foreign fishing boats apprehended each year.

Australian Customs Service: 1155976

Heavy landing craft HMAS *Labuan* tows a seized vessel to port during Operation 'Breakwater'. The fact that the RAN must resort to the use of landing craft points to the scarcity of patrol vessels to cover Australia's 37,000 km coastline.

Coping with increases

The additional resources will meet the costs associated with the apprehension, transportation, processing and accommodation of the several thousand extra illegal fishermen likely to be detained each year as a result. It will also fund the expansion of fishing boat management and destruction facilities, and the subsequent additional investigations and prosecutions.

As part of the new plan, the Joint Offshore Protection Command (JOPC) will assume responsibility for operational co-ordination and control of civil maritime enforcement activities. The creation of this single command centre to undertake planning, surveillance, intelligence analysis and deployments will facilitate a co-ordinated, cross-agency approach to border protection.

The DoD will also continue its current commitment to the Civil Maritime Surveillance Programme led by Customs, mainly through Operation 'Cranberry', to detect, intercept and deter potential illegal activities in coastal and offshore regions. This includes a commitment of up to 1,800 patrol boat days and 250 flying hours by Royal Australian Air Force (RAAF) AP-3C Orion maritime patrol aircraft.

Australian Customs Service: 1155977

A catch of shark fin, the supply of which is driven by demand from the Chinese market.

It is anticipated that a doubling in the number of foreign fishing vessels apprehended in Australia's northern waters will reduce the impact of incursions on fish stocks, and perhaps of equal importance, have a detrimental economic effect on Indonesian fishermen, who almost always have their boats confiscated and then destroyed. It is hoped that this and the prospect of imprisonment in Australia will act as significant economic deterrents.

The success of both new and existing initiatives will depend to some extent on the ability of Canberra to convince (or coerce) Jakarta to play its part in discouraging illegal fishing activities in Australian waters by Indonesian fishermen and organisations.

As part of developing a co-operative and, where possible, integrated strategy with Indonesia on this issue, additional officers from Customs, the AFP and the Department of Agriculture, Fisheries and Forestry will be deployed to Jakarta to work with Indonesian regulatory and enforcement agencies in addressing the problem, and plans include a permanent counsellor in Jakarta to provide a focus for liaison with the central government.

Australia will also fund a major public information campaign in Indonesia to promote a better understanding of the problems that illegal fishing causes for both countries.

Spending initiatives tighten the net on fishing incursions

Australia is increasing its spending to help seal up its porous maritime borders and clamp down on illegal activities in its Exclusive Economic Zone. New initiatives in response to foreign fishing incursions include:

- **AUD24.9 million for the establishment of a rotary-wing long-range rapid response capability to more effectively deal with foreign vessel landings and abandoned boats;**
- **AUD65.9 million for the upgrading of the processing facility for foreign fishermen in Broome, Western Australia, the establishment of facilities in Gove and Weipa, modifications to the extant facility in the Torres Strait, and the construction and operation of new boat-destruction facilities;**
- **AUD9.6 million over four years from 2006–07 for increased intelligence support for Australia's onshore surveillance and interdiction capabilities, and to provide greater support to policy, intelligence and enforcement agencies engaged in fisheries compliance and maritime enforcement;**
- **AUD18.5 million over three years from 2006–07 to enhance charting of the Torres Strait and northern sector of the Great Barrier Reef to enable RAN and customs vessels and other enforcement agency vessels to navigate reliably in previously uncharted waters where illegal activity may occur;**
- **AUD2 million for the establishment of a dedicated patrol/response vessel stationed in the northern waters of the Great Barrier Reef Marine Park;**
- **AUD14 million to fund the use of civilian charter vessels to tow apprehended illegal foreign vessels;**
- **AUD6.9 million to engage indigenous community groups to help monitor the bio-security risks from illegal foreign fishing vessels, with a review of the programme in 12 months;**
- **AUD6.3 million for increased officer training and equipment on customs patrol boats to address the risks associated with boardings of foreign fishing vessels, and the establishment of a project team to bring forward the replacement of the customs extant patrol boat fleet; and**
- **AUD17 million to charter a vessel to boost Customs' capacity to respond rapidly to incursions.**

Tougher penalties for those convicted of illegal fishing, including custodial sentences for those apprehended in Australian territorial waters, are to be considered.

The longevity of co-operative efforts with Indonesia remain tenuous, however, with the fluctuating relationship between Canberra and Jakarta likely to jeopardise such plans. During periods of political and diplomatic tension between the two parties, Jakarta has intimated on more than one occasion that it is prepared to withdraw its support for Australian initiatives in Indonesia against people smugglers and illegal fishing operators known to be emanating from that region.

Australian Customs Service: 1155978

The crew of this iceboat deployed anti-boarding poles and set fire to them, brandished knives and machetes, and threw lead weights and burning objects at the Customs boarding party before being apprehended in waters off northern Australia in late 2005.

Evidence has also emerged of a definitive Chinese link in the chain of illegal fishing activity in the waters of northern Australia.

Findings presented at a parliamentary committee hearing in March 2006 told of incursions by Chinese-owned fishing vessels harvesting shark fins and other fish species that command high prices in mainland China, where reports indicate that shark fins can fetch USD100 to USD150 per kilogramme.

A number of these boats are relatively large steel-hull fishing vessels and iceboats, which contrast starkly with the motorised wooden boats used by individual Indonesian fishermen. In April, two steel-hull 35 m stern trawlers registered to the Peoples' Republic of China were apprehended and towed to nearby ports where they are likely to be disposed of.

However, in March 2006, authorities were forced to release the 75 m *Chen Long* — the biggest illegal fishing vessel detected in Australia's northern waters — after advice that a successful prosecution was unlikely under existing laws.

Deputy commander of the JOPC told the hearing that while it is unlikely the incursions are being controlled directly from mainland China, the indications are that vessels are under the control of Chinese companies based in southeast Indonesia and possibly Malaysia.

In April 2005, federal fisheries minister Ian Macdonald told media that "there is some evidence that this is organised, transnational criminal activity. It is very big. It's become increasingly transnational in its form as our intelligence is discovering".

Indeed, there is evidence to suggest that the commercial fishing industry on the Great Barrier Reef is being infiltrated by Chinese crime syndicates. The gangs are reportedly seeking to extend their control of the fish markets in Hong Kong and throughout Asia, and see Australian waters — rich in sought-after species such as coral trout — as lucrative hunting grounds.

Disease risk

In addition to the threat to fish stocks, incursions by larger vessels are seen to pose a disease risk, as they support bigger crews, sometimes 20- or 30-strong. With crews often living on board with livestock such as poultry and pigs, conditions on most vessels are invariably found to be highly unsanitary.

Australian Customs Service: 1155979

A boarding party from *Oceanic Viking* boards the 76 m, 2,145-tonne FV *Taruman* in international waters south of Tasmania.

Crews are known to regularly stop off and come ashore at secluded locations on the Australian mainland and camp while replenishing, making repairs or sitting out rough weather.

Of late, seized vessels have been found fitted with detailed charts, satellite phones, high-frequency radios, depth sounders and navigational aids, on which the RAN and Customs officers have found the co-ordinates of numerous mainland locations where it is suspected vessels regularly visit for the crews to come ashore.

As such, authorities remain concerned about the possibility of highly contagious diseases being introduced to and taking hold on the mainland, a number of which could devastate Australia's livestock and agricultural industries within a few years. These include foot-and-mouth disease, avian influenza (bird flu), bovine spongiform encephalopathy (mad cow disease) and rabies.

The presence of livestock from Indonesian villages and rural centres where these diseases are known to occur and their transport on fishing vessels that subsequently anchor on the Australian coast also raise the prospect of these animals coming into contact with feral pigs. These animals populate many farming belt areas of Australia and thrive in the tropical regions of the Kimberleys in Western Australia, the top third of the Northern Territory and vast tracts of land in north Queensland.

The majority of technological solutions that Canberra has applied to northern border surveillance and patrol over the past five years have been designed to improve the ability of government agencies to detect, identify and track air and surface craft entering Australian airspace and territorial waters.

Compared to other countries in its region of interest, such as India with 7,500 km of coast and more than 40 inshore and offshore patrol vessels, Australia remains underequipped to survey its 37,000 km coastline with just 22 patrol boats shared between the RAN and Customs.

This scarcity of patrol vessels results in a continuing deficiency to respond, intercept and prosecute all surface craft detected entering Australian waters illegally.

Nonetheless, major inroads have been made recently in the detection of suspect vessels through the introduction of advanced radar technology such as the Jindalee Over-the-horizon Radar Network (JORN), which enjoys a detection range of around 3,000 km, although less favourable environmental and atmospheric conditions are understood to reduce this figure and render JORN less effective for short periods.

Some AUD62 million-worth of upgrades to JORN are currently being implemented, aiming to improve radar sensitivity and integrate all three radars to create a single national over-the-horizon radar network.

Originally developed by the Defence Science and Technology Organisation (DSTO) and now Daronmont Technologies, the Surface wave Extended Coastal Area Radar (SECAR) provides broad-area littoral surveillance in selected focal points around the northern coastline. SECAR is able to detect surface craft and low-flying aircraft out to around 300 km.

Another locally developed system is the Sea-Watch underwater surveillance system. Understood to have performed well in recent harbour trials, Sea-Watch is thought to be in use in extended shallow-water coastal locations.

While relatively few in number, the RAN's new 57 m, 300 tonne Armidale-class patrol boats are a significant enhancement in all capability areas over the 1970s-designed Fremantle class, which they will replace by the end of 2007. Each of the 14 vessels being built by Western Australia's Austal offers better endurance, seakeeping, armament and sensor and communications suites. Seven have so far been delivered.

The availability rate per vessel is also improved to the extent where six full 21-man crews are assigned to each division of four boats. The crews rotate between vessels, permitting maximum time at sea per vessel, while in turn reducing the annual sea day commitment required of each crew member.

The Armidales are complemented by eight Customs-operated 38 m Bay-class patrol boats, also built by Austal.

In March 2006, Customs signed a AUD1 billion 12-year contract with Surveillance Australia for a more intensive and effective aerial surveillance capability. Under the Civil Maritime Surveillance 2004 contract, the new service will see a doubling of the number of long-range fixed-wing electronic surveillance aircraft and will comprise six Dash 8-202 and four Dash 8-315 aircraft. All will be fitted with an electronic surveillance and target detection suite of electro-optic and infrared sensors and synthetic-aperture radars.

Mariner trials

Led by DSTO and the RAAF, trials of a General Atomics Mariner unmanned aerial vehicle (UAV) over Adelaide and the resource-rich North West Shelf off the coast of Western Australia concluded in late September. The Mariner — equipped with an electro-optical/infrared camera, an automatic identification system and a look-down surface search multimode patrol radar — accumulated more than 75 flight hours during the trial.

Simulated trials of a Northrop Grumman RQ-4B Global Hawk UAV have also been conducted in the US. The results of these and the Mariner trials will help to inform the functional performance specification and operational requirements for Phase 1B of Project Air 7000, which seeks to provide the RAAF with a multimission UAV between 2009 and 2011. Funding allocated to Phase 1B is AUD1 billion to AUD1.5 billion.

Customs has also called for tenders seeking the trial, over two years, of its own mid-size UAVs for the broad-area maritime and coastal surveillance role.

Additionally, the service is in the process of awaiting industry responses to a Request for Tenders calling for the provision of a "rapid response helicopter to help deal with illegal foreign fishing incursions" into Australia's northern waters.

To be based at Gove in the Northern Territory, the new helicopter will carry up to six Customs officers. Its principal role will be to respond to landings by foreign fishing vessels and their crews on and around the isolated Arnhem Coast and Gulf of Carpentaria.

Commencing in January 2007, Customs will charter an armed patrol vessel for 12 months of service in northern waters. It will be capable of operating independently at sea for extended periods and acting as a command ship. ■

RELATED ARTICLES:

- *Australia completes Mariner UAV trials*, jni.janes.com, 20.10.06.
- *Australia plays safe with Armidale patrol boats*, jni.janes.com, 03.10.06.
- *Jane's Fighting Ships* (jfs.janes.com).

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NEWS IN BRIEF

● Insyte, QinetiQ team for MRR
BAE Systems Integrated System Technologies (Insyte) and QinetiQ have teamed to bid for the UK's forthcoming maritime Medium Range Radar (MRR) requirement. The MRR is intended to deliver a significantly enhanced capability over that provided by the Type 996 E/F-band surveillance and target indication radar currently fitted aboard most major Royal Navy surface ships. The requirement is for approximately 20 systems to fit to Type 23 frigates, major amphibious ships, two new Future Carrier vessels and two shore facilities.

● Barco displays for UAE
Selex Sistemi Integrati has down-selected Barco's TL-351 displays for the combat management system to be integrated into the United Arab Emirates's (UAE's) new Baynunah-class corvettes. Deliveries of the new screens began in September 2006.

● Aonix supports Aegis OA
Lockheed Martin has selected Aonix's PERC Ultra virtual machine to help with the development of the Aegis Open Architecture (OA) combat system programme. PERC Ultra provides deterministic garbage collection, real-time threading and ahead-of-time compilation, as well as virtual machine managing tools to meet Aegis OA's high-speed requirements.

● BAE Systems guns for USCG
BAE Systems received its third contract from Northrop Grumman to build a 57 mm Mk 110 Mod 0 Naval Gun System to go aboard the US Coast Guard's National Security Cutter. The third gun is scheduled for delivery in July 2007. BAE Systems delivered its first Mk 110 for the Coast Guard programme in January 2006, and will deliver the second gun in December 2006. The first of the Legend-class National Security Cutters, USCGC *Bertholf*, was launched in September 2006.

● Virginia-class fairings order
Goodrich has been awarded a subcontract from General Dynamics Electric Boat to provide lightweight, composite towed-array fairings for the US Navy's Virginia-class nuclear submarines. Goodrich stated that its Engineered Polymer Products team in Jacksonville, Florida, would manufacture, test and deliver the fairings beginning in 2006.

Halliburton goes ahead with KBR float despite warnings from UK MoD

BY GUY ANDERSON AND BEN VOGEL

KEY POINTS:
- *Halliburton pursues KBR flotation and issues warning to investors.*
- *MoD may seize KBR's holding in Devonport Management Limited.*

DML: 0585953

DML, which runs Devonport Royal Dockyard, may be affected by stock flotation.

Oil services group Halliburton went ahead with the initial public offering (IPO) of its KBR subsidiary on 16 November 2006, despite UK Ministry of Defence (MoD) warnings that it may seize its stake in the Devonport naval dockyard on the grounds of "national security".

The government was due to make a risk assessment of the IPO's implications, but the MoD told *Jane's* after the IPO that "we haven't had time" to do this.

Halliburton — which raised around USD440 million from the divestment of a 17–19 per cent stake in KBR — warned potential investors of the implications of the MoD's move in a filing to the US Securities Exchange Commission on 14 November.

The group said: "The UK MoD advised us that if we proceed with this offering without satisfying the MoD, it will have little option but to take steps to safeguard the essential security interests of the UK.

"The MoD may assume control of the Devonport Royal Dockyard at any time and dispose of DML's [Devonport Management Ltd's] interests."

KBR holds a 51 per cent stake in DML, alongside Balfour Beatty (24.5 per cent) and Weir Group (24.5 per cent).

DML's position as the only UK yard with the capability to refit and refuel nuclear submarines — plus its expertise in naval modernisation and weapon systems upgrades — prompted the MoD's concerns.

The MoD told *Jane's* it was considering its position in the wake of the IPO. "Our concern is to protect UK strategic assets. We need reassurances over KBR's financial and management arrangements," an official said.

KBR had warned: "Proceeding with this offer without satisfying the MoD, or the loss of DML's interest in the Devonport Royal Dockyard and the loss of our interest in DML, could have a material adverse effect on our future prospects."

Options available to the MoD include making "DML's interest in the Devonport Royal Dockyard non-voting", removing DML's directors from the site and assuming control of the company's interest. It may also seize the stake and dispose of it on KBR's behalf.

Rosoboronexport reveals extent of export orders

BY GUY ANDERSON

Russia's state defence export agency, Rosoboronexport, has announced that naval export orders currently account for USD4.1 billion of its total order backlog of USD21.5 billion.

This funding cuts across the gamut of naval defence work and is accounted for by 150 contracts relating to the repair, construction and modernisation of naval vessels.

"This year [2006], naval equipment will be [ranked] second after aircraft equipment in the export structure of defence products," said Rosoboronexport's First Deputy Director General, Vladimir Pakhomov.

Russia's naval backlog has been bolstered by announcements during recent months such as India's decision to exercise an option for three additional Project 1135.6 Talwar-class (Krivak III) guided-missile frigates from Russia at an estimated cost of EUR1.2 billion (USD1.5 billion).

Overall, the backlog of Rosoboronexport — which accounts for 80 per cent of all Russian defence export contracts — has risen sharply this year. The agency announced in July 2006 that its order book stood at USD17 billion; a total that amounted to four years of work.

The order book is expected to swell even further in 2007 as Russia looks towards more foreign growth. Export sales of USD7 billion are expected next year; a total that will account for 40 per cent of the workload of Russia's defence companies.

Competing design ambitions threaten DCN, Navantia submarine partnership

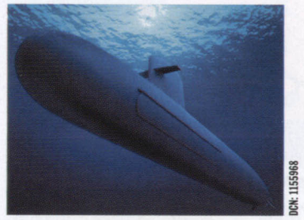
BY RICHARD SCOTT

The partnership forged by French naval shipbuilding and systems group DCN and its Spanish counterpart Navantia in the conventional submarine export market looks set to break apart as the two companies look to further their rival international ambitions.

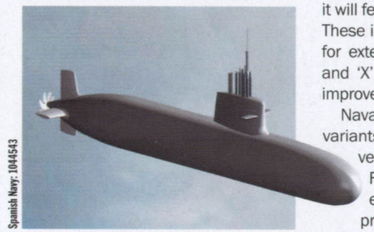
Despite securing 10 orders for variants of their jointly developed Scorpene design over the past nine years, a growing schism has emerged at corporate level as the two partners seek to bring their respective Marlin and S-80A designs to the market.

DCN and Navantia (then Empresa Nacional Bazan) signed a co-operation agreement in the early 1990s to jointly design, develop, market and build the Scorpene family of diesel-electric submarines. To date, orders have been secured from Chile (for two boats, commissioned in 2005 and 2006 respectively), Malaysia (two boats for delivery from 2009) and India (six submarines to be delivered between 2012 and 2017).

For both the Chilean order (contracted through DCN International) and the Malaysian deal (primed by Armaris), DCN and Navantia have shared construction activities under an industrial workshare agreement. DCN builds the pressure hulls and forward sections at its Cherbourg shipyard, Navantia completes the aft sections at its Cartagena yard, with each partner taking responsibility for consolidation, integration, trials and acceptance of one submarine from each order. The Scorpene programme achieved its most notable success to date in October 2005 when India signed a EUR2 billion (USD2.5 billion) deal for six boats to be delivered under the prime contractorship of Armaris. All six submarines will be built locally by Mazagon Dock Limited with assistance from DCN and Navantia.


DCN: 1155968

DCN is now offering the Marlin submarine design in preference to the Scorpene.


Spanish Navy: 1044543

Navantia is to push the S-80A design developed for the Spanish Navy to the international market.

However, the future of the relationship built up around Scorpene is now in question as both DCN and Navantia seek to promote new, similarly sized air-independent propulsion (AIP) submarine designs on the international stage.

Earlier this year DCN unveiled a new non-nuclear submarine concept, known as Marlin, which it says will supersede Scorpene on the export market. DCN is offering Marlin to Pakistan, which has a requirement for three boats, to be built locally, to replace its ageing Agosta 70 submarines.

According to Pierre Quinchon, DCN's head of Warships and Systems, Marlin "will build on Scorpene experience but also incorporate lessons learned from the design and development of the French Navy's new Barracuda nuclear-powered attack submarine".

He added: "Marlin will be slightly larger than Scorpene, and while it inherits combat system and diesel-electric propulsion systems from Scorpene, it will feature a number of differences. These include the Mesma AIP system for extended submerged endurance, and 'X' form aft control surfaces for improved manoeuvrability."

Navantia meanwhile is marketing variants of the new S-80A design developed for the Spanish Navy. Four boats are on order, to enter service from 2011, with production of the first boat under way in Cartagena.

Unlike Scorpene and Marlin, which are marketed in close conjunction with the UDS International SUBTICS combat system, the S-80A submarines for the Spanish Navy will have a new combat system developed by Navantia FABA in partnership with Lockheed Martin. In addition, the S-80A will be equipped with a new 400 kW ethanol reformer fuel-cell AIP system.

Despite their seemingly intractable positions, both companies insist that they are keeping the door ajar in an effort to resolve their differences. A spokesman for Navantia told *Jane's*: "In any case, the decision to end the relationship has to be taken by mutual agreement of the parties."

See jni.janes.com for more on this story

ASC prepares Air Warfare Destroyer shipyard tender

BY JON GREVATT

Australian shipbuilder ASC is to issue a tender in January 2007 to develop a shipyard that will become the company's construction and consolidation site for Australia's Air Warfare Destroyer (AWD) programme.

The company is currently seeking interest in the AUD100 million (USD76.8 million) contract and has said that more than 20 commercial, architectural and engineering firms are vying for the project.

In a statement the company said the new shipyard, which will be located adjacent to existing facilities in Osborne, will include dedicated AWD production facilities, new offices, a wharf support building with office space and workshops, and a significant upgrade of existing facilities.

John Gallacher, chief executive officer of ASC, said: "Our shipyard production facilities and infrastructure will need to be capable of handling and transporting ship components weighing up to 1,200 tonnes each — this is no common development project."

VT Group expects consolidation outline in 2006

BY GUY ANDERSON

An outline agreement on consolidating the UK's naval shipbuilding base in line with the Ministry of Defence's (MoD) Maritime Industrial Strategy (MIS) is likely to emerge before the end of 2006, VT Group Chief Executive Paul Lester has indicated.

The sale of VT Group's shipbuilding interests to BAE Systems remains a potential outcome of the discussions, Lester added, along with a formal alliance approach between the two partners.

Lester's comments, which came as the shipbuilding and support services group announced its interim results on 14 November 2006, follow UK Defence Procurement Minister Lord Drayson's call for a commitment to progress on MIS before the end of the year.

"I do not think we will have a deal by Christmas but we should have the framework of a deal," Lester added.

"This will involve BAE Systems and VT Group, as between us we account for 85 per cent of naval shipbuilding in the UK. We support consolidation, but it must be good for VT [shareholders]. We must be in a better market position [as a result of any agreement]."

Outlining the potential outcomes of the discussions with BAE Systems, Lester suggested that the sale of his company's shipbuilding interests was at "one end of the scale". The other possibilities included an alliance (through which BAE Systems and VT Group would act as one while remaining as two separate entities) or a joint venture.

"The other option is, of course, to do nothing," Lester added. "We have a good business here [in shipbuilding]."

Lester declined to be drawn on the most likely outcome, but hinted again that shipbuilding — which currently accounts for 20 per cent of group revenues — may not be a feature of VT Group more than a decade from now. "We think it is better to be a support services company in the longer term," he said. An attempt at consolidation foundered earlier in the year, when a VT, BAE Systems bid failed to acquire Babcock.

UK Industry executives warn on timeline for successor submarine

BY DENISE HAMMICK AND RICHARD SCOTT

KEY POINTS:
- *The UK has yet to decide whether to replace its strategic deterrent capability.*
- *Industry is seeking a firm commitment from government to assure the long-term viability of the UK submarine enterprise.*

Senior executives from the UK submarine industry have formally warned parliament that the indigenous capability to design and build nuclear-powered submarines will be jeopardised unless the government makes a firm commitment to a successor submarine programme to replace the four current Vanguard-class boats from about 2024.

Giving evidence before the House of Commons Defence Committee (HCDC), officials from both BAE Systems and Rolls-Royce said that the industry needed a firm commitment from government on a future submarine build programme in order to assure continuity of work and long-term viability.

Murray Easton, managing director of BAE Systems Submarines, the UK's sole submarine builder, went as far as to claim that failure to commit to a Vanguard-class replacement programme in the near term would have "a catastrophic effect" on the UK's submarine enterprise.

BAE Systems Submarines: 1148677

Industry has warned government on a Vanguard-replacement timetable.

The UK government has yet to decide whether to replace the strategic deterrent capability vested in the four Vanguard-class submarines and their Trident D5 strategic weapon system. It is due to release a white paper before the end of 2006, to be followed by a parliamentary debate and vote.

Having previously examined the strategic context and timetable for a decision on the renewal of the deterrent, the HCDC is now considering the level of investment needed to sustain essential infrastructure and core skills in the UK design and manufacturing base.

Giving evidence to the committee on 7 November, Easton said: "I feel we are at critical mass just now in the design and build, and below this I think we're in a perilous state."

He added: "Continuity of work for designers, builders and the design trades is necessary. If [skilled engineers] don't get it here they will work elsewhere."

Easton also insisted that stability of employment was "the key to retaining skilled individuals", pointing out that the "haemorrhaging" of experience in the industry following the end of the Vanguard-class programme had been a significant factor in the delays that have blighted the Astute-class design and manufacture programme.

Steve Ludlam, president of Nuclear business for Rolls-Royce, which manufactures the Nuclear Steam Raising Plant for UK submarines, told the committee that the industry was attempting to maintain critical skills and improve affordability, but that it remained fragile in parts and faced significant challenges in sustaining capability.

"A 22-month manufacturing drumbeat is something we can work to," he said. "If the government would look to that it would be more helpful."

See jni.janes.com *for more on this story*

Armaris and Elefsis team on Greek FREMM bid

BY RICHARD SCOTT

Armaris, a DCN/Thales joint venture company, has signed a teaming agreement with Greek shipbuilding group Elefsis Shipbuilding and Industrial Enterprises (Elefsis Shipyards) to offer a solution based on the FREMM multimission frigate for the Hellenic Navy's next-generation anti-air warfare frigate programme.

The memorandum of understanding, announced by the two companies on 25 October, will see Armaris and Elefsis Shipyards work together to capitalise on their respective prime contracting expertise and develop a technology transfer package to enable in-country manufacture of the new frigates. In addition, the companies are discussing what role Elefsis Shipyards could play as a strategic partner to DCN/Thales for French national programmes and third-party export opportunities as part of a longer term co-operation.

The Franco-Italian FREMM programme was launched in November 2006. A total of 27 ships are planned, comprising 17 for France and 10 for Italy; firm orders have so far been placed for 10 ships (eight for France and two for Italy).

The Hellenic Navy's new frigate programme is a key part of the five-year armament plan approved in July 2006 by the Greek government's Council for Foreign Affairs, Defence and Security. It is expected to procure an air warfare system based around an advanced multifunction radar.

Other bidders for the frigate programme are expected to include ThyssenKrupp Marine Systems (which owns Hellenic Shipyards) and Navantia.

Contenders include Lockheed Martin (offering the Aegis Weapon System and associated SPY-1 radar), Thales Nederland (proposing a suite based on the APAR and SMART-L radars), BAE Systems Integrated Systems (promoting its Sampson Integrated Weapon System) and a team of Saab Systems and CEA Technologies (using the latter's CEAFAR active phased-array radar).

Canada seeks to kick-start shipbuilding plan

STEPHEN TRIMBLE

Canada's Maritime Forces Command is seeking to revitalise its struggling domestic shipbuilding industry with a new long-term plan that calls for buying a new vessel almost every year for the next 25 years.

"If one looked at the whole workload over the course of 25 years, the best thing to happen for the Canadian shipbuilding industry would be to have something that was predictable and without any peaks and valleys but rather a general loading," Chief of the Maritime Staff Vice Admiral Drew Robertson said on 25 October.

"The Canadian shipbuilding industry can rise to meet that challenge, and I'd like to set the conditions in the long-term," added Robertson, speaking to reporters at the Canadian Embassy in Washington, DC.

Robertson's vision is to align the navy's orders for new ships with the modernisation needs of other government agencies to break a "boom-and-bust" ordering cycle that has frustrated the domestic industry.

During the next 15 years, government and commercial demand for Canadian ships is projected to attract orders for new ships worth CAD8.6 billion (USD7.6 billion), said Peter Cairns, president of the Canadian Shipbuilding Industry.

Robertson described the navy's plans to place a new batch of orders over the next decade, starting with three Joint Support Ships (JSS) to be delivered by 2015. That is to be followed with an upgrade programme for the Halifax-class frigate fleet, to be completed by 2017. Finally, a replacement for the Iriquois-class command-and-control fleet should be delivered from 2017–19.

"I would hope that at that point we would be into a period of sustained construction," Robertson said.

Four industry teams have responded to the navy's tender for the JSS. "That gives us a sense of the capability that the industry is willing to build. The latent capacity is there," he said.

Cairns said shipbuilding industry officials intend to meet with government officials to obtain a formal government commitment to the navy's "continuous shipbuilding" procurement strategy, as well as industrial incentives.

"The problem that we have is the governments only last so long and they tend not to look longer than their mandate," he added.

Rear Admiral George Zambellas DSC

Royal Navy Chief of Staff (Transformation)

The UK is undertaking a five-year programme to streamline the support operations of the Royal Navy. *Denise Hammick* talks to Rear Admiral George Zambellas about his role as temporary head of the transformation process

The UK Royal Navy (RN) is taking a long, hard look at its support operations in a bid to transform into a more efficient and capable force, and the man charged with doing this — albeit temporarily — is Rear Admiral George Zambellas.

"I expect to be in the post for just under a year," he tells *Jane's*, after which the process he has kick-started will be transferred and absorbed into the responsibility of the Chief of Staff, Vice Admiral Paul Boissier, on behalf of the Commander-in-Chief Fleet.

"There has been a little confusion about why you need a two star [Admiral] to do this, but I think it's become clear that our transformation programme is too big to be delivered in the margins of a day job without the front line suffering," Adm Zambellas says.

Indeed, since August 2006, Adm Zambellas has been overseeing a process which in the next five years will dramatically streamline the support area of the RN to save money and create a more agile capability for operations.

"What we're aiming for [long term] is what we've called command-pull focus rather than a force generated by pushing assets towards it. [So] instead of saying here you are, this is what you've got to work with, what we'd like to see in the future is that commanders can say in order to achieve certain effect, these are the assets we identify as being needed.

"Support operations are in many areas suffering from duplication and there is room for improvements, which we need to drive through.

"This will mean job losses, of around 1,500 people, but that's the price we pay for improving the processes and saving money," he says.

"I suspect we'll lose a lot of officers of middle rank over the next five years, but also some senior officers."

Adm Zambellas' job is to look at and rationalise the support role of about 9,000 personnel, which is roughly a third of the fleet's budget area, to see what parts of their job are efficient and should be retained, and which are unnecessary and should be discarded.

The effects of this "ambitious programme" are going to be significant and will happen with "incredible pace", says Adm Zambellas, while insisting it will not necessarily be headline grabbing — more "a quiet revolution where dramatic change comes from within.

Denise Hammick: 1155994

"I suspect we'll lose a lot of officers of middle rank over the next five years, but also some senior officers"

"Some of us are not proud of the duplication we have at the multiple points of contact we have in the existing structure, and we're keen to make it better."

At the moment, he tells *Jane's*, "some people, sometimes dozens of people, are working in the same area at the same time in different parts of the defence machine.

"We don't want to continue to invest in the existing structure and the existing processes."

This, he says, is a long-term solution to make savings and generate capability on the front line.

The 'we', he adds, includes the many front-line commanders he is consulting for their views as part of the redesign, which he emphasises is being directed from the bottom up.

"Those officers are buying into this, they believe in it; it's their chance to change things to make things better and in that sense I think the timing is right."

Creating the goal of a command-pull focus has "got quite strong resource implications for the years to come", he adds, but "you won't see significant departures as such; it'll be people... who just don't get replaced when it's time to retire. We're not actually making people redundant".

Instead, it will be a process of natural wastage — which actually began to reduce manpower before the transformation programme took off — with the primary role of the programme being to reduce the amount of work that needs to be done so that gapping does not increase the workload of those who remain, which will gradually increase efficiency.

"What will happen is the revised processes will be less densely populated and the existing population will be moved around to fill existing holes and shortfalls," he says.

"If we get a poor process by saving manpower, it wasn't worth doing. We have to find better ways of doing business," he says, creating enhanced military effects.

The programme is going to take around six months to initiate and will roll out over the next five years, but results should start to become obvious soon.

"Some of them will emerge quite quickly, around December 2006, but in other cases, depending on how the sequence changes, they might be coming months later."

He tells *Jane's* that one of the first things to change will be in the training process.

"We [currently] have a production line for training people that creates qualified people who're then held in a waiting position until a job becomes available. Their core skills erode and then they need to retrain.

"We need a more agile process to get the skills you want at the right time, when needed."

Adm Zambellas has the authority to implement changes quickly, some immediately, to improve the way the navy does business.

"The clever thing is to get much improved processes first, and then a capping structure we believe in, and then steadily improve on both." ■

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- *DLO targets further savings in naval support*, **Jane's Navy International**, 20 February 2006.
- *RN seeks to pare back base infrastructure costs*, **Jane's Navy International**, 3 August 2006.

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